THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXXV. No. 884.] LONDON, APRIL 20, 1880. [32nd Year. Price 6d.

GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
BLACKWALL, E.;
OFFICES:
26, 27, & 28, FENCHURCH ST.,
LONDON, E.C.

GENUINE TORBAY PAINT
RESISTS
SULPHURETTED HYDROGEN.
Does not Blister, Crack, or Flake off.
Has very large surfacing powers.
THE TORBAY PAINT COMPANY,
(Proprietors) STEVENS & CO.,
21, Great Winchester St., London, E.C.
Works: BRIXHAM, DEVON.

TUBES.
Tubes and Fittings for Gas, Steam, Water, and Hydraulic purposes, plain, galvanized, white enamelled inside, or coated by Dr. Angus Smith's process, or oxidized by Professor Barff's patent process. Gas-fitters tools, brass cocks, &c.
JOHN SPENCER,
VULCAN TUBE WORKS,
WEST BROMWICH, STAFFORDSHIRE,
AND
97, CANNON STREET, LONDON.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
Manufacturers of
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
Paris, 1878.
Head London Office:
145, QUEEN VICTORIA STREET.
ALMA TUBE-WORKS, WALSALL;
OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
Manufacturers of
WET AND DRY GAS-METERS,
Licensees and Manufacturers of
HUNTS
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
Established 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
Manufacturers of
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work.
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
"OTTO" GAS-ENGINE,
From ½ to 40 H.P. ind.
See Advertisement in last week's JOURNAL, page 546.

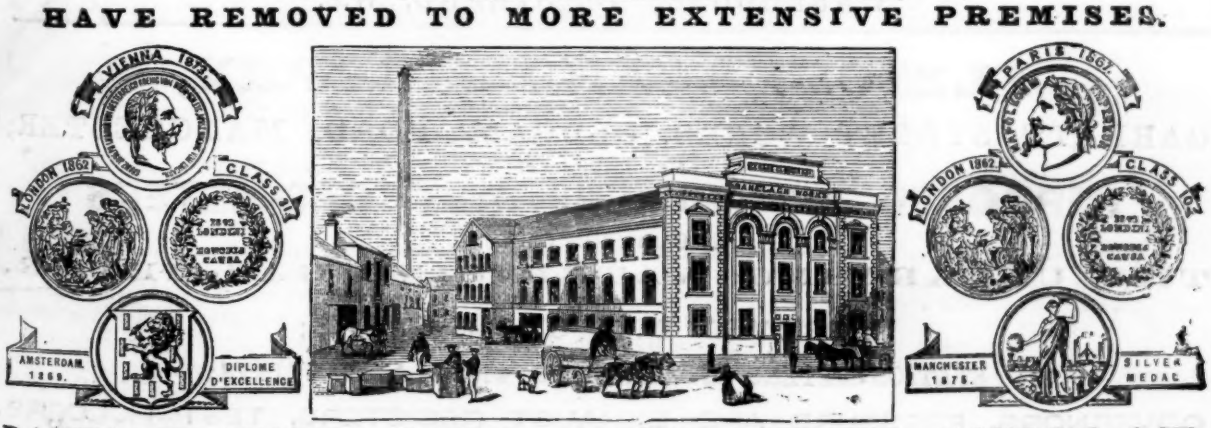
CROSSLEY BROTHERS,
MANCHESTER AND LONDON.

THE
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.
ESTABLISHED 1840.

CHANGE OF ADDRESS.

GEORGE GLOVER AND CO.,

DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES.



RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

WELLINGTON TUBE WORKS,

GREAT BRIDGE, TIPTON, STAFFORDSHIRE.

JOSEPH AIRD,

GAS, STEAM, AND HYDRAULIC TUBES AND FITTINGS.

PORTBURY, PATERSON, & CO.,

WET AND DRY GAS-METER MANUFACTURERS.

STATION-METERS, PRESSURE-GAUGES, &c., of the Highest Excellence only.

VICTORIA METER-WORKS, EXETER.

MESSRS. FLETCHER, BURROWS, & CO.,

ATHERTON COLLIERIES, near MANCHESTER,

ARE PREPARED TO MAKE CONTRACTS FOR THE SUPPLY OF

CANNEL AND OF THEIR ARLEY MINE GAS COAL,

WHICH ARE OF ACKNOWLEDGED EXCELLENCE.

Their Coal is in use in the Salford, Stafford, Bolton, and other large Gas-Works in England, Ireland, Wales, and Abroad, giving in practical working 10,300 feet of 17-candle Gas, and 15 cwt. of superior Coke per Ton of Coal.

GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

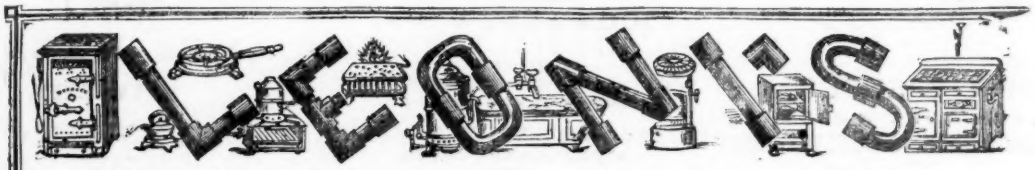
Near BARNSLEY.

This Company is now in a position to raise 2000 tons per day of REAL OLD SILKSTONE GAS COAL.

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.



OF FAMILY GAS KITCHENERS,

COOKERS, HOT-PLATES, STOVES, BATH-BOILERS, &C; SENT FREE.

ADAMAS WORKS, ISLINGTON, LONDON. N.,

WAREHOUSE: 74, STRAND, W.C.

FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER;

Manufacturers of

IMPROVED CONSUMERS WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS.

And all kinds of Experimental Gas Apparatus.

NO MORE WASTE LIME! SAVE THE VALUABLE PRODUCT!

G. R. HISLOP'S PATENT REGENERATIVE PROCESS

Most Effectively and Economically restores this waste *ad infinitum*.

The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

For Terms, apply to GEO. R. HISLOP, F.C.S., Engineer, Gas-Works, PAISLEY, N.B.

PARIS EXHIBITION, 1878.

THREE MEDALS
AND
HONOURABLE MENTION
HAVE BEEN AWARDED TO
JOSEPH CLIFF & SONS
For their Various Exhibits, amongst which is a
SILVER MEDAL
FOR THEIR
PATENT MACHINE-MADE
RETORTS AND FIRE-BRICKS,
Being the Highest Honour given for this class.

Established

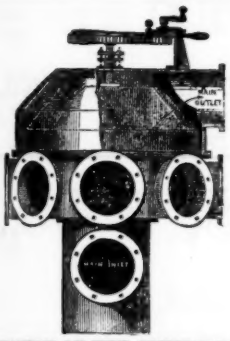
1795.

JOSEPH CLIFF & SONS,

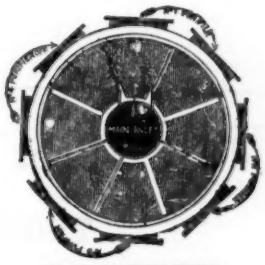
THE ORIGINAL
WORTLEY FIRE-BRICK WORKS,
NEAR LEEDS,
London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

C. & W. WALKERS' PATENT CENTRE-VALVES.


ELEVATION OF THE CENTRE-VALVE.

PLAN OF THE VALVE.


PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

MIDLAND IRON-WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

WILLEY & COMPANY,

GAS ENGINEERS,

WORKS: COMMERCIAL ROAD, EXETER,

INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

EVERY DESCRIPTION OF GAS APPARATUS.

ENGINEERING DEPARTMENT.

NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

GASHOLDERS AND TANKS.

RETORTS and RETORT-HOUSE FITTINGS, CONDENSERS, SCRUBBERS, ENGINES and EXHAUSTERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, &c.

METER DEPARTMENT.

They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

GAS-FITTING DEPARTMENT.

An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

☞ PLEASE NOTE THE ADDRESS—

GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

GAS PURIFICATION
BY
OXIDE OF IRON.
GAS PURIFICATION & CHEMICAL Co., LIMITED,
PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

LAMBERT BROTHERS, WALSALL.
ALPHA TUBE & FITTING WORKS
Manufacturers of W. J. WARNER'S PATENT MARKET GAS STAND-PIPE.

Now ready, GAS CHANDELIER BOOK (Reduced Prices), 7s. 6d.

ROBT. DEMPSTER & SONS,
GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS;
CONTRACTORS FOR THE

ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

MESSRS. NEWTON, CHAMBERS, & CO.,
THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD,

MANUFACTURERS OF

IMPROVED CENTRE-VALVES,
PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

WEST'S GAS IMPROVEMENT COMPANY.
LIMITED,

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,
And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

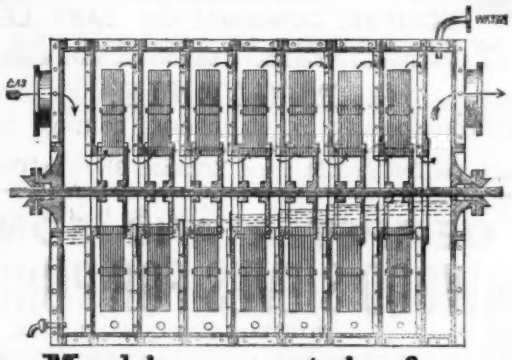
The advantages attending its use are—

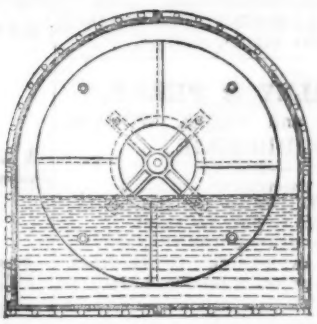
INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER COMPANY.





These Machines contain from 3200 feet to 65,000 feet of Wetted Surface.

The Special Merits of this Washer are as follows:—That it is not necessary to reduce the temperature of the gas to 60°, or thereabouts, to make it effective; and that as no tar is retained in it, the illuminating power is not reduced as in Tower Scrubbers. That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas as it ascends. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine, as well as a very large quantity of carbonic acid and sulphuretted hydrogen. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

MESSRS. KIRKHAM, HULETT, and CHANDLER. *The Gaslight and Coke Company, York Road, King's Cross, Jan.* 14, 1879.

Gentlemen,—In reply to your inquiry, I am pleased to say the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, it takes out every particle of Ammonia, while purifying more Gas than it was intended to do. I enclose particulars of a week's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c., (Signed) JOHN CLARK, Engineer.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 *feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—*

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmosphere.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 7	11	9	7	5½	3⅝	3	1⅝	1½	½	0	10 Gallons.	59,000	Nil.	74°	66°	31°	25	23½	5
„ 8	9½	7½	6	4½	3	2	1	¾	¼	0	10 „	78,000	Nil.	73°	61°	31°	28	26½	4½
„ 9	11	9	7	5	3⅜	2½	1½	1	½	0	10 „	82,000	Nil.	74°	67°	33°	27½	25½	5
„ 10	10⅜	8½	6½	5	3½	2½	1½	1	½	0	10 „	66,000	Nil.	76°	64°	28°	28½	27	5
„ 11	12½	10	7⅝	5⅜	4½	3½	1⅝	1¼	½	0	10 „	61,000	Nil.	73°	64°	27°	26½	25½	5
„ 12	11	8⅜	6½	—	—	—	1½	⅝	½	0	10 „	39,000	Nil.	74°	64°	27°	26½	25½	5
„ 13	13	10⅜	8½	6	4⅜	3½	2	1½	½	0	10 „	78,000	Nil.	73°	65°	42°	28	26	5

MESSRS. KIRKHAM, HULETT, and CHANDLER. *Corporation of Birmingham, Gas Department, Saltley Works, May* 23, 1879.

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Working Results obtained from KIRKHAM, HULETT, *and* CHANDLER'S *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March* 6, 1879.

Gas passing per Hour, Cubic Feet.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	No. of Divisions and Strength of Liquor.										Water Used during Experiment. Gallons.
		SH_2	CO_2.	Grains. NH_3.	Washer.	Air.				10	9	8	7	6	5	4	3	2	1	
64,000	Inlet	2·00	2·00	158·8	72	57	21	4½	Twaddel deg. at 60°	5·3	4·9	2·85	2·35	1·7	1·05	0·6	0·3	0·15	0·1	63
	Outlet	1·50	1·50	0·8	63	57	20		Acid, ounces.	11·0	8·4	6·3	4·5	2·7	1·7	1·3	0·7	0·3	—	

MESSRS. KIRKHAM and HERSEY. *The Leeds Corporation Gas-Works, Meadow Lane, Aug.* 14, 1879.

Gentlemen,—In reply to your inquiry of yesterday's date, I have pleasure in stating that the item appearing as income derivable from Ammonia in my estimate of revenue for current year is not an exaggeration. Our average income from Ammonia is 2s. 8d. per ton of coals carbonized, but at the works where your invention is in use we derive not less than 3s. per ton. Since the introduction of efficient Scrubbers at our works the greater yield of this product (now twice as valuable as coke to us) is such that the cost of Apparatus for its extraction can be wholly paid for out of from nine to twelve months gains. I am, Gentlemen, yours faithfully, (Signed) H. WOODALL, Engineer.

MESSRS. KIRKHAM, HULETT, and CHANDLER. *Woolwich Equitable Gas Company, Engineers Office, Nov.* 1, 1879.

Gentlemen,—In answer to your inquiry respecting Washer erected here in September last, and which has been working here constantly since Oct. 1, I beg to say that it is working very satisfactorily. We sell over 24 gallons of 10 oz. liquor per ton of coal carbonized, and depend upon your Washer to extract all Ammonia, which it does satisfactorily, not leaving a trace of free Ammonia at the outlet. It takes little power to drive it, and the difference of pressure between inlet and outlet is scarcely noticeable, being less than half an inch. I consider it a very valuable machine, and have little doubt that it will pay for the outlay in a very short time. I shall be pleased to show it to any one that may be in want of such a machine, when they can see its capabilities themselves.—I am, Gentlemen, yours faithfully, (Signed) W. WHITE, Engineer.

MESSRS. KIRKHAM and HERSEY. *Heywood Local Board Gas-Works, Hooley Bridge, Heywood, Dec.* 1, 1879.

Gentlemen,—In reply to your favour of the 28th ult., I beg to state that the Scrubber is at work, and doing well. I shall be glad to show it to any inquirers.—Yours truly, (Signed) EDWIN BUCKLEY, Engineer.

MESSRS. KIRKHAM and HERSEY. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Dec.* 19, 1879.

Gentlemen,—In accordance with my promise that I would inform you as to the working of the "Standard" Washer erected by you here in June last, I now write to say that we are passing through it 100,000 cubic feet per hour (the quantity for which it is made) direct from the Condensers, "bye-passing" the whole of our Scrubbers, which, not being needed, have been standing still since the "Standard" Washer was put in use. It seems as though the Washer more effectually removed the Ammonia when taking the full quantity of gas than less; as, at the present time, at the sixth chamber (there being eleven in all) not a trace can be discovered either by turmeric or acid litmus paper. The difference in pressure between inlet and outlet is only ten-tenths of an inch. I need scarcely say, after the above, how perfectly satisfied I am. (Signed) P. J. WATES, Engineer.

For further particulars and testimonials, address Messrs.

KIRKHAM, HULETT, & CHANDLER, LIMITED, { 59 & 60, Palace Chambers, Bridge St. Westminster, London, S.W.

C. & W. WALKER'S
WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE.
FINSBURY CIRCUS, LONDON.

MOBBERLEY & PERRY,
FIRE CLAY and BRICK WORKS,
STOURBRIDGE.

Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAY.
Manufacturers for Home and Export.
GAS-RETORTS, GLASS-HOUSE FURNACE,
BLAST-FURNACE, TANK BRICKS, LUMPS, TILES,
And Every Description of Best Fire-Bricks.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE
FIRE CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

ESTABLISHED IN 1860.
BENJAMIN CARPENTER,
THE ORIGINAL MANUFACTURER OF THE IMPROVED
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,
22, HERMES STREET, PENTONVILLE ROAD,
LONDON, N.

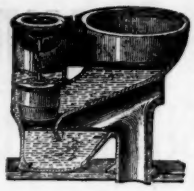
The Dunston Engine Works Co.,
GATESHEAD-UPON-TYNE.
Are the Sole Manufacturers of
Archer's Patent Hoists,
ALSO OF
Archer's Patent Stone Breaker,
AND OF
Archer's Patent Ore Crusher & Pulveriser,
The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

GEORGE'S
Patent Gas Calorigen,
A STOVE FOR
WARMING AND VENTILATING.
RECOMMENDED BY DR. RICHARDSON.

MANUFACTURERS:
J. F. FARWIG & CO.,
36, QUEEN STREET, CANNON ST., LONDON.

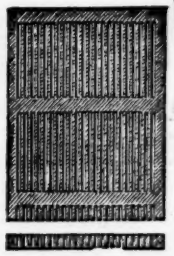
Gold Medal Awarded, Paris Exhibition, 1878.

THOMAS TURTON AND SONS,
SHEAF AND SPRING WORKS,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
SCREW STOCKS, TAPS, AND DIES, SPANNERS,
RATCHET BRACES, LIFTING-JACKS,
ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

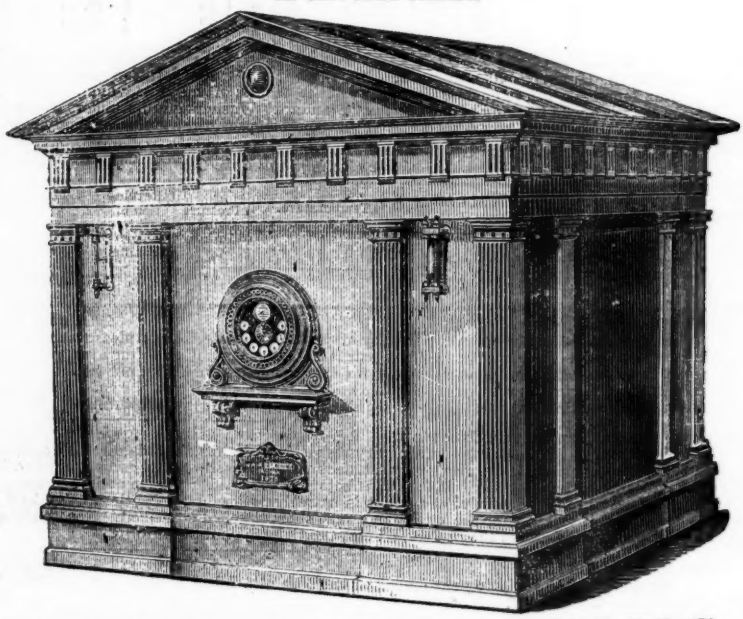


SMEATON'S TRAPLESS CLOSETS.
MESSRS. W. SMEATON & SONS,
HOT WATER AND SANITARY ENGINEERS.
PATENTEES AND INVENTORS OF THE
TRAPLESS, THE D TRAP, AND EDDYSTONE CLOSETS.
Also the New
ECLIPSE COMBINATION CAST LEAD TRAP.
The Price will be half of the old-fashioned D Trap, it being cast all in lead, without a Joint.
Send at once for an Illustrated Price List to their Wholesale and Retail Agent,
G. R. GLENIE,
WALBROOK HOUSE, 37, WALBROOK, LONDON, E.C.

A large Discount to the Trade and Shippers. Estimates Given and Contracts Taken.

R. DEMPSTER AND SON'S

WOOD SIEVES FOR PURIFIERS,
WITH TAPER OR PARALLEL BARS,
MADE BY SPECIAL MACHINERY.
SCRUBBERS FILLED WITH BOARDS,
On our approved principle, for the extraction of Ammonia.
Prices on application. References to First-Class Engineers.
ROSE MOUNT IRON-WORKS,
ELLAND, NEAR HALIFAX.
LONDON OFFICES: 2, SUFFOLK LANE, CANNON STREET, E.C.

J. & J. BRADDOCK,
GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET & DRY CONSUMERS GAS-METERS,
OF THE HIGHEST EXCELLENCE ONLY;
BRADDOCK'S PATENT COMPENSATING GAS-GOVERNORS;
ALSO LICENSEES AND MANUFACTURERS OF
WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;
ROUND STATION-METERS,
ON CAST-IRON STANDS.



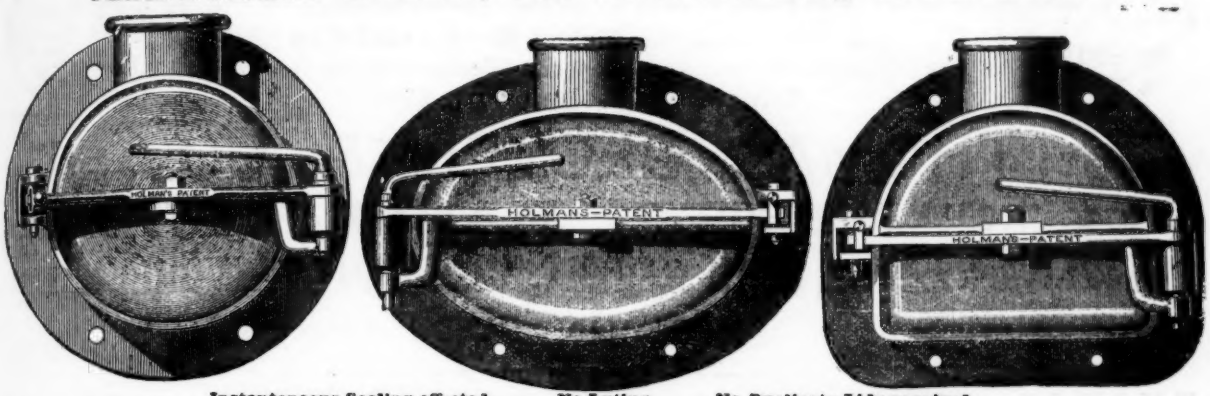
SQUARE STATION-METERS,
WITH PLANED JOINTS.
GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.
GAS COOKING APPARATUS.
Home and Foreign Orders promptly attended to.
All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.
Orders almost invariably despatched on the day of receipt.
TERMS, &c., ON APPLICATION.

TANGYE BROTHERS AND HOLMAN,

CORNWALL HOUSE, QUEEN VICTORIA STREET, LONDON, E.C.

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,
Anti-Friction Catches, and Self-Sustaining Cross-Bars.



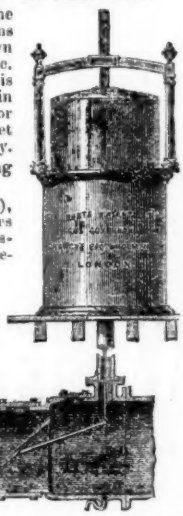
Instantaneous Sealing effected. No Luting. No Duplicate Lids required.
Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Morton's Patent Retort-Lids are in use in nearly all the Principal Gas-Works in the United Kingdom and the Colonies; also on the Continent and in the United States of America. They are now made of the

SAME FORM OR SECTION AS THE RETORT. (See Illustrations above.)

Engineers preparing Specifications of New Works will be furnished with Dimensions of Stock Patterns, together with Approximate Weight and other data on application.

HUNT'S
EQUILIBRIUM DIRECT-MAIN GAS GOVERNOR.



In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

These Governors have been adopted by many leading Gas Companies, among whom are the following:–

The Gaslight & Coke Co. (19), The London Gas Co (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Leicester, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

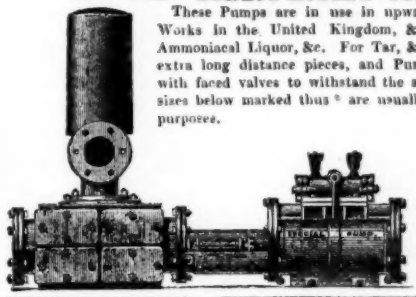
The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) JOHN JOHNSON.

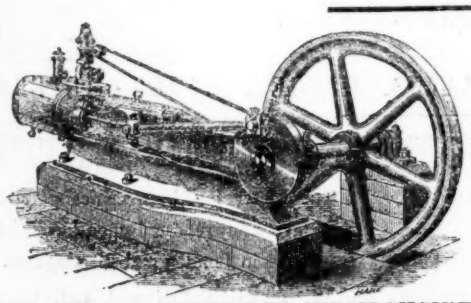
THE
"SPECIAL" DIRECT-ACTING STEAM-PUMP.



These Pumps are in use in upwards of one hundred Gas-Works in the United Kingdom, &c., pumping Water, Tar, Ammoniacal Liquor, &c. For Tar, &c., they are provided with extra long distance pieces, and Pumps are entirely of iron, with faced valves to withstand the action of the liquid. The sizes below marked thus * are usually kept in stock for these purposes.

The quantities delivered of Tar should be taken about two-thirds that of water.

Diameter of Steam Cylndr.	Diameter of Water Cylndr.	Length of Stroke.	Gals. of Water per Hour, Approx.	Prices for Water.	Prices for Tar and Ammoniacal Liqr.
*3 in.	1½ in.	9 in.	450	£16 0 0	£17 0 0
*4 ,,	2 ,,	9 ,,	815	18 0 0	19 0 0
*5 ,,	2½ ,,	12 ,,	1,250	21 0 0	23 10 0
*5 ,,	3 ,,	12 ,,	1,830	22 10 0	24 0 0
*6 ,,	3 ,,	12 ,,	1,830	25 0 0	26 10 0
*6 ,,	4 ,,	12 ,,	3,250	30 0 0	31 10 0
6 ,,	5 ,,	12 ,,	5,070	35 0 0	36 10 0
*7 ,,	5 ,,	12 ,,	5,070	40 0 0	41 10 0
7 ,,	6 ,,	12 ,,	7,330	45 0 0	46 10 0
*8 ,,	6 ,,	12 ,,	7,330	50 0 0	52 0 0
10 ,,	6 ,,	12 ,,	7,330	60 0 0	62 10 0
10 ,,	8 ,,	12 ,,	13,000	75 0 0	77 10 0



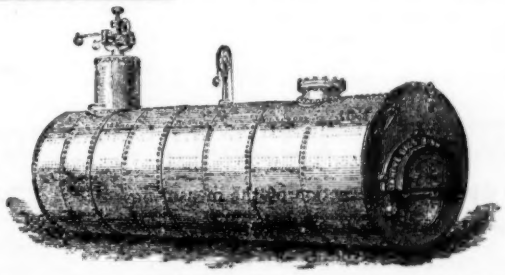
TANGYE'S HIGH-PRESSURE STEAM-ENGINE,

NEARLY 4000 IN USE.

The Design, Workmanship, and low prices of these Engines have called forth universal approval.

Nom. H.P.	2	3	4	6	8	10	12	14	20	25
	£28	£37	£44	£68	£86	£111	£122	£133	£185	£215

Including Governor and Feed Pump. Variable Expansion extra.



CORNISH, LANCASHIRE, "THE KESTERTON," VERTICAL, AND MULTITUBULAR STEAM-BOILERS OF SUPERIOR QUALITY ALWAYS IN STOCK.

This Department having been greatly extended and furnished with the most approved Boiler-making Machinery and Tools, T. B. & H. are prepared to supply all kinds of Steam-Boilers with great facility at lowest current prices.

Also Makers of IMPROVED HYDRAULIC HOISTS, TRAVELLERS, CRABS, CRANES, PULLEY BLOCKS, HYDRAULIC AND SCREW LIFTING JACKS, LATHES, PUNCHING AND SHEARING MACHINES, And all other Descriptions of Tools, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, &c., ON APPLICATION.

London, 1851. New York. 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters bv the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

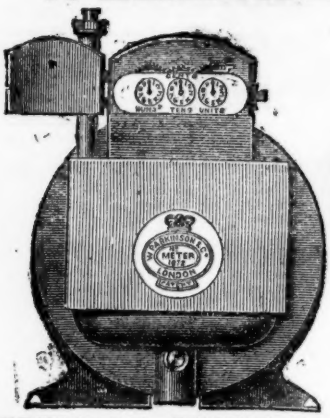
214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.,



(ESTABLISHED 1816,)

MANUFACTURERS OF

WET & DRY METERS,

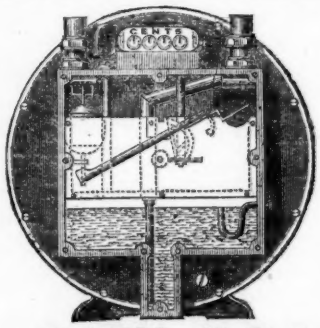
STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.

HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

CONTENTS.

	Page
Circular to Gas Companies:—	
The Metropolitan Amalgamations	589
The Want of a Municipality for London	589
The Meeting of the Tottenham and Edmonton Gas Company	589
The Differential Charge for Gas by the Walsall Town Council	589
The Exhibition of Gas Appliances at Leicester	589
The Cardiff Gas Company and the Corporation	590
The Coming Meeting of the West of Scotland Association of Gas Managers	590
Water and Sanitary Notes:—	
The Metropolitan Water Question	591
Meeting of the Sheffield Water Company	591
The Water Accounts of the Stockton and Middlesbrough Corporations	591
The Corporation of Wolverhampton and their Water Undertaking	591
Water Affairs at St. Helen's and Whiston	591
Spongy Iron for Softening a Town's Water Supply	592
Leading Articles:—	
Pumping Gas at Beckton for Distribution in London	590
Urban Water Supply	592
The Metropolitan Water Question	593
Lightning Conductors	595
Correspondence:	
Spence's Metallic Compound and its Use for Pipe-Joints	595
The Bray Lantern and Burner, and Mr. Sugg	595
Spongy Iron for Filtering the Water Supply of Towns	596
The Manufacture of Sulphate of Ammonia	596
Legal Intelligence:—	
High Court of Justice—Chancery Division—Buenos Ayres Gas Company and Bower *v.* Wilde	596
Surrey Sessions—Appeal against a Conviction for Illegal Use of Gas	597
Miscellaneous News:—	
Extensions at the Newcastle and Gateshead Water-Works	590
The Use of Gas in Libraries	590
The Building Exhibition at the Agricultural Hall	590
Gas Map of London	590
West Bromwich Gas Supply	590
Smethwick Local Board Gas Supply	591
Scarborough Water Supply	597
Meeting of the Tottenham and Edmonton Gas Company	597
Metropolis Water Supply	597
Exhibition of Gas Apparatus at Leicester	598
Meeting of the Rio de Janeiro Gas Company	599
The Sewerage of Abingdon and Torquay	600
Bray's Burners and Lanterns for Street Illumination	601
Meeting of the Sheffield Water-Works Company	601
Wolverhampton Corporation Water Supply	603
Stockton and Middlesbrough Corporations Joint Water Board	603
On the Use of Water in Ascension-Pipes. By Mr. W. A. Wood, of Syracuse, U.S.A.	603
Trade Reports	604
Tampering with a Gas-Meter	604
Register of Patents:—	
Applications for Letters Patent	604

TO CORRESPONDENTS.

A Subscriber.—*The contractor, in the first instance.*

Civis Romanus.—*Thanks for letter of the 10th inst. received. We will endeavour to get and publish quotations such as you ask for; but the difficulty is to obtain them at all reliable. Many of those published in trade price lists are very misleading.*

H. S. G.—*The Third Volume of "King's Treatise on Coal Gas" is in active preparation, part being in the printers hands. You will see due announcement made in the* Journal, *on its approaching completion.*

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 20, 1880.

Circular to Gas Companies.

The Metropolitan amalgamations being thus far completed, gas affairs are in a state of quiescence; and they will probably remain so until a further advance is made towards the union which we earnestly desire soon to see effected. Not that this will produce any disturbance, for the policy of such combination is so obvious that all but a very few wonder why the London Gaslight Company should stand out from a union which would be most advantageous to their interests. On this point, however, we need not at present say more. Having frequently pressed the Company to join with others, we are not disposed to indulge in too often reiterated advice. We have not yet made the final appeal, which must be made when the question of the purchase of the Metropolitan Gas Companies comes up for consideration. That this question will arise is generally admitted—it is only a matter of time, which is not at present ripe for the purchase of the gas undertakings, but which is certain to come. At present no hint is given that the Metropolitan Authorities have any desire to buy up the most valuable property they could possess. They may or may not obtain the Water Companies, but in any case it will be found extremely advantageous to effect the purchase of the gas and water undertakings together. The lines laid down for the purchase of the water undertakings in Mr. Cross's Bill may very well be followed. There is the definite value of the dividends, and the probable increment of profits for a certain number of years. These taken together would, of course, represent a considerable sum, but when a Trust is issuing three and a half per cent. paper stock, it matters little what sum their paper may represent. We shall not attempt to appraise the value of the gas undertakings, leaving that for more competent authorities to settle. But why speculate at present? Neither one purchase nor the other will be effected until we have a Municipal Government for London. It is all very well to speak of a Water Trust, but the outcry presently will be for a body that can absorb all the undertakings which furnish what are called "the "necessaries of life." Among these, of course, gas will form a prominent portion, and we fully expect that when an energetic reformer undertakes the reconstruction of the local government of London, the purchase of the Gas Companies works will receive a large share of attention.

We see that there is some talk of the re-introduction of Lord Elcho's Bill. We have in past times expressed an opinion that this measure did not satisfy the requirements of the situation. A stronger hand than Lord Elcho's will be required to effect substantial reformation in the present government of London. If one or two of the leading members of the Liberal party, who will probably soon find themselves in office, will take up the matter, something may perhaps be done; but we confess that the prospect is not hopeful. Metropolitan public opinion is hardly advanced enough for such a radical change as would abolish the Vestries and the Metropolitan Board of Works. The latter body, perhaps, are expecting dissolution, but we shall not attempt to hurry an event which must come by a natural process. This process may be accelerated by the action of the ratepayers, and if Mr. Beal's Association is true to its vocation, and has sufficient moral power to induce the Government to accept its opinions, we may look to it for very important results. As we have said, however, public opinion is not quite ripe for revolutionary changes in the government of London. Patient and steady work for years will be required before it will be made obvious to the Metropolitan ratepayer that it will be to his advantage to have a government which can adequately control his public affairs.

The half-yearly meeting of the Tottenham and Edmonton Gas Company was held at Tottenham on the 10th inst., and the report presented by the Directors was highly gratifying. The Company are, of course, in a position to pay maximum dividends, and to carry over, after adding £500 to the reserve-fund, a balance of £790. We notice that the reserve-fund has now risen to large proportions—so much so, we fancy, as to justify the Company in reducing the price of gas in their district. Nothing is wanted in Tottenham and Edmonton to ensure a large consumption but cheap gas. It is a common saying in the neighbourhood, however, that "Tottenham is "the last place God made." We hope it will not be the last place in which gas will be cheap.

The propriety of the Walsall Town Council charging a differential rate for the gas supplied beyond the borough boundary, was called in question at the last meeting of the Corporation, when one of the members, who had given the requisite notice of his intention to do so, moved—"That in "the opinion of this Council it is desirable to repeal that "part of section 45 of the Walsall Gas Purchase and Borough "Extension Act, 1876, which enacts that an additional "charge of sixpence per thousand cubic feet shall be made "for gas supplied for public or private consumption in the "parts of the borough outside the limits of the Walsall "Improvement Act of 1848." This proposal did not meet with the favourable reception evidently wished for it by the mover of the resolution, who frankly confessed that he had been a party to the arrangement at the time it was made, excusing himself for his early change of opinion on the ground that he was then "only a junior member of the "Council, and trusted to older members doing nothing but "what was right." The "seniors," no doubt judging that it was too soon to amend an Act passed as recently as 1876, promptly agreed, by thirteen votes to three, to insert the word "not" before "desirable;" and in this altered condition the motion was passed.

Following closely upon the exhibitions of gas apparatus at Ipswich and Sleaford, to which reference was made in the last number of the Journal, comes one of a similar character, held under the auspices of the Corporation of Leicester, and, as recorded in another column, inaugurated by the Mayor on the 12th inst. The repetition of such exhibitions as these is unquestionably calculated to enforce upon the public mind the advantages of gas for cooking and heating purposes. To make such displays thoroughly successful, however, they should, as the Mayor very pointedly put it in his opening address, show that gas appliances can be used with economy. If it could be demonstrated, he said, that joints may be cooked or manufacturing operations carried on with greater ease and less cost

by means of gas, than if coal is the medium employed, gas apparatus would be sure to be adopted. In the face of obvious advantages, the public are, nevertheless, slow to adopt and to adapt themselves to new appliances and modes of procedure; but if, by having such displays as these, householders and manufacturers are eventually brought to the belief in the thorough adaptability of gas to many more purposes than those to which it has hitherto generally been applied, the promotors of these exhibitions will surely be justified in congratulating themselves upon having instituted a work which will have for result the immediate benefit of the gas industry and the ultimate good of mankind.

The Cardiff Gas Company and the Corporation are in anything but friendly relations. The Corporation complain that the illuminating power of the Company's gas is defective, whilst, as a matter of fact, their own Examiner reports that the power is always in excess of that required by the Company's Act. These petty squabbles are always contemptible, but they are obliged to be taken notice of. The price of the gas supplied by the Cardiff Company compares very favourably with the rate charged by surrounding Companies and Local Authorities, so the Cardiff Corporation have a clear case before them. They must either submit to the prices the Company righteously impose, or buy the works on such terms as Parliament may grant. What these terms will be we shall not presume to indicate; they must be left for the consideration of a Parliamentary Committee.

The eighth annual meeting of the West of Scotland Association of Gas Managers will be held at Hamilton on the 29th inst. Mr. R. Mitchell, of Coatbridge, is the President of the Association for this year. The advisability of amalgamating with the North British Association of Gas Managers will again occupy the attention of the members; and probably some definite conclusion may be arrived at on this question, which has now been agitated at several recent meetings. Three papers will be read—one by Mr. Niven, of Dunoon, entitled "The Elaborate and Tedious Thermometric and "Barometric Calculations Relative to Coal Gas Simplified;" the second by Mr. Mayer, of Glasgow, on "Painter's Hydro-"static Joint for Gas and Water Mains;" and the third by Mr. Brodie, of Paisley, on "Gasholder Construction"—in addition to which a report on Mr. Hislop's process for the re-burning of foul lime will be presented.

Extensions at the Newcastle and Gateshead Water-Works.—Three additional filter-beds in connection with these works at Throckley have just been completed. Water was admitted to them on Thursday afternoon, in the presence of Mr. Main, the Secretary of the Company, who opened the valves for the purpose. The works are of a substantial character, and have been executed under the superintendence of Mr. J. F. Bateman, C.E.

The Use of Gas in Libraries.—In the course of a paper read last Wednesday, before the Society of Arts, by Mr. George Bullen, F.S.A., Keeper of the Printed Books at the British Museum, the following passage occurred:—"Dry heat is the greatest enemy to books, which require proper ventilation as well as human beings. Gas is supposed to be particularly injurious; and, doubtless, the upper portion of an unventilated gas-lighted room is particularly obnoxious, so that books on shelves near the ceiling are likely to be specially injured. As to other positions, it is not clear that the heat emitted by gas is more destructive than the same amount of impure air from other systems of lighting; in fact, the library in which the books were in the worst state of powdery decay I have ever seen, was placed in rooms lighted by lamps and candles. This question, although it has long been debated, remains still unsettled."

The Building Exhibition at the Agricultural Hall.—The exhibition of building appliances, &c., to which reference was made in last week's Journal, and which was opened to the public on the 12th inst., fairly well carries out the aim of its projectors to present to the public a complete collection of the various articles required in the construction, furnishing, and decoration of a modern dwelling-house. Of course, the most attractive exhibits are those in the classes devoted to furniture, ironmongery, &c., but these, apart from their artistic beauty and excellence of workmanship, can scarcely be said to have any interest for our readers. In connection with the gas industry, however, it should be mentioned that Messrs. Jones and Willis show some really beautiful specimens of wrought-iron gas-fittings and art metal work, which are rivalled though not outshone by the gorgeous display made by their neighbours, Messrs. R. Evered and Co., whose Early English gas-fittings are exceedingly tasteful, and worthy the attention of those whose fancy leads them to prefer the antique. Cooking by gas is represented by one solitary firm—Messrs. Beverley and Wylde, of Leeds—who show three of their patent gas kitcheners, lined with white glazed tiles; while gas heating and ventilating appliances are exhibited by Verity Brothers and Ritchie and Co. Kidd's combination gas and oil light affords an illustration of how the illuminating power of gas may be improved, and Stott's gas-valve shows how consumers may regulate the supply at the burners. The "Bisschop" and "Otto" gas-engines are there as examples of the utilization of gas for furnishing motive power. Water-meters, filters, closets, and sanitary appliances are well shown by Messrs. Smeaton, Ransome, and others; and in the special department of ventilation, Messrs. Boyle are conspicuous by their show of patent self-acting air-pump ventilators, by means of which the foul air of buildings of every description may be extracted without draughts or currents. In Class II.—Bricks, Stone, Concrete, &c.—Messrs. J. Cliff and Sons and Eastwood and Co., Limited, make a good display; and among the miscellaneous exhibits are articles in some way connected with building operations, from lightning conductors to luminous basements. The exhibition has a certain amount of attractiveness for the general public, and has been fairly well patronized. It will remain open until the 24th inst., and it is to be wished that success may attend the labours of its promoters.

PUMPING GAS AT BECKTON FOR DISTRIBUTION IN LONDON.

During last autumn there were erected at the Beckton station of The Gaslight and Coke Company—for pumping pure gas from the gasholders at that station to London through the distributing mains—six of the largest exhausters hitherto made. These exhausters, or pumps, were designed for the purpose of utilizing to a greater extent than before the present two 48-inch mains between Beckton and the distributing stations of the Company in London, by increasing the pressure of the gas at Beckton as the demand required.

There are three engines, each working a pair of 250,000 cubic feet per hour exhausters, making the total quantity of gas pumped per hour equal to 1½ million cubic feet, and these have been in successful operation during the past winter. On some occasions as much as 1¾ million feet of gas per hour have, during foggy weather, been pumped for successive hours to London. So satisfactorily have the engines and exhausters done their work, that very little comparative oscillation of water-gauge occurred at Beckton, and nothing perceptible at the distributing stations in London, where the gas was sent direct to the public.

The two mains under the ordinary holder pressure would deliver 1 million cubic feet of gas per hour to London, so that the economical advantages of forcing the gas by the means described are at once apparent, as without the aid of extra pressure the necessary quantity of gas could not have been sent without laying, at a heavy cost, a third 48-inch main to London, and even then the gas would have reached town at a comparatively low distributing pressure.

It is believed that this is the first instance of gas being supplied direct to the consumers by pumping. The whole arrangement has worked so well during the past winter, that the pumping power is about to be increased by one more engine and two additional exhausters, and these are now being made by Messrs. B. Donkin and Co. They are to be in operation before next winter, when the total nominal pumping power will be equal to 2 million cubic feet of gas per hour; and this quantity it is intended to force through the existing two 48-inch mains.

During the spring and summer months the gasholder pressure is sufficient to force the gas to London, and it is only necessary to work the above-named machinery during the winter months. Therefore steam-engines of the non-condensing single-cylinder type were selected. They are horizontal, of 40-horse power nominal, and three are already fixed. Each of them is fitted with a feed-pump capable of supplying feed water sufficient to generate steam for the whole of the three engines. These engines also have a solid steel crank-shaft with double bearings, to which, by universal couplings, there are attached direct two of the 250,000 feet per hour exhausters, one on each side, their slides being fixed at right angles. These couplings are so designed as to admit of either one of the exhausters being readily disconnected and laid idle, thus allowing the engine to drive only one exhauster. They also accommodate themselves to any unequal wear that may arise, which is an important provision.

The exhausters are on J. Beale's improved patent principle, with one slide instead of two, giving a greater bearing in the drum or axle, and greatly reducing the wear and tear. The nominal speed of each exhauster to pass 250,000 cubic feet per hour is 50 revolutions per minute, and with eight exhausters at work they would give the 2 million cubic feet of gas per hour as before mentioned. They have, however, been worked at 60 revolutions per minute and upwards.

The special feature of this gas-pumping plant is its unusual magnitude, the exhausters being larger than any yet made. The pumping or forcing of so large a volume of gas as 1¾ million cubic feet per hour direct through distributing mains to the public, with little or no perceptible oscillation of gauge, is also a novelty.

The problem having been so successfully solved at Beckton, it is a question how far the same means may be adopted in other gas-works to supply gas through existing mains which have become too small for their work, by the increased and increasing demand for gas. In many works it may probably be worth consideration whether it would not be more economical to erect pumping plant similar in character to that we have been describing, rather than take up old mains and relay larger ones. This system might also facilitate new gas-works being erected some little distance from large towns, and perhaps allow the choice of sites better adapted for the delivery of coal, &c.

With this week's number is issued a double-page engraving representing two views of one of the engines, with its two exhausters attached, showing the method of coupling; also the general arrangement of the exhauster-house. To supply steam, there are six two-flued Lancashire boilers with Galloway tubes. Only four, however, are required to work at one time when coke is used, but with breeze five are necessary.

The whole arrangement was designed by Mr. G. C. Trewby, M. Inst. C.E., the Chief Engineer of the Beckton Gas-Works. The engines and exhausters were made by Messrs. B. Donkin and Co., of Bermondsey, London.

Gas Map of London.—The amalgamation of the Phœnix and the South Metropolitan Gas Companies having been carried out, Mr. Preston Davies, of 6, Victoria Street, Westminster Abbey, announces that he is prepared to supply maps of London showing the boundaries of the Gas Companies as they are at present.

West Bromwich Gas Supply.—At the last meeting of the West Bromwich Improvement Commissioners, the Gas Committee reported that three months previous notice of the intention of the Commissioners to complete the purchase of the gas undertaking on the 1st of July next was given to the Corporation of Birmingham on the 30th of March.

Water and Sanitary Notes.

The Metropolitan Water Question has once more come prominently to the front. As we announced a fortnight ago, the delegates of the Vestries were to hold a meeting on Friday last, which meeting duly came off. It was presided over by Mr. E. J. Watherston, who was the convener, and it probably took some people by surprise to find this gentleman arguing in favour of going on with Mr. Cross's Bill. We, who have nothing to say against the measure, leave Mr. Watherston to persuade the Metropolitan Vestries that the scheme propounded in Mr. Cross's Bill is the only just one that could be presented, and the only one the Companies could accept. Perhaps the best defence of Mr. Cross's measure is that which has been recently published by Mr. R. Price Williams, who, in a letter to *The Times*, has shown to demonstration what is the exact value of the Companies undertakings. He puts it on a fair basis, and states that the true measure of their value is "their net earning power." He shows that the net revenue of all the Companies in the year 1878 was £833,180, and that after paying £139,516 out of this for interest on debentures (£3,183,169), there remained £693,664 available for the payment of dividends, at the average rate of seven and three-quarters per cent. on the £8,915,555 of the ordinary stock of the Companies. Mr. Williams goes on to show that the average seven and three-quarters per cent. dividend on £8,915,555 would suffice to pay three and a half per cent. on £19,818,972. The annual net revenue of the Companies is constantly increasing, and must continue to do so; but just as this revenue becomes larger, the available profits for the payment of interest on water stock increase. For instance, for the past year the amount of net revenue available for the payment of dividends on the ordinary stock of the Companies increased to £773,455, and the amount of three and a half per cent. water stock represented by this increased revenue in the first schedule of the Metropolis Water-Works Purchase Bill amounts to £22,098,700. The inference, therefore, is, that the Water Trust has the prospect of making a profit which will be increasing year by year, and in the course of time, it may be, leave on their hands the water-works free from incumbrance.

Such is the prospect which some people think lies before Mr. Cross's Water Trust. We shall not attempt to disturb their speculations, for they are founded on calculations which have been accepted by all the Water Companies, and we may say by all accountants and speculators who are able to judge of the matter. Whether Mr. Cross's proposed Water Trust will ever exist or not, remains a doubtful question. Whoever may be the next Home Secretary, he is certain to be strongly pressed to take up the much vexed question of the Metropolitan Water Supply. Can he do better than at once adopt Mr. Cross's Bill? The Companies are satisfied with it; the Metropolitan Vestries, it would appear, are not altogether dissatisfied; but still a feeling prevails that the measure is not all that could be desired. There is a wish on the part of the Vestries to have further conferences, and eventually to meet Government officials, with whom to consult as to what shall be done in the present complex state of affairs. The Bill, if it should go on, must necessarily be referred to a Select Committee, by whom it will receive a severe examination. It is the evident desire of the Vestries that the Bill should proceed, in order that it may receive this investigation. They are, of course, by no means satisfied with the terms laid down in the scheme; but as they know that they will not obtain better, there is a half disposition to accept them. The idea at present is that another conference shall take place, to which the Metropolitan members shall be invited, so that, if possible, some sort of scheme may be concocted in order to be presented for approval to the Metropolitan constituencies and the Government. In the meantime, it would appear that the Metropolitan Board of Works are about to take up the question. Their success, we think, will be extremely doubtful, unless they choose to adopt Mr. Cross's Bill, or something very much like it. The Water Companies cannot succumb to extraneous agencies. Their value must be properly assessed, and they must have the opportunity of accepting or rejecting the terms offered. The first really reliable valuation of the undertakings has just been made, and is embodied in the present Bill. To this Bill the Companies have given their assent, and nothing that the Board of Works may do can shake the confidence in the soundness of the conclusions come to by the valuators engaged in this matter. Nevertheless, we cannot remonstrate with the Metropolitan Board of Works for making a desperate effort to buy up the water-works. It is a forlorn hope; the more so as it is coupled with the proposal to introduce a competing supply. Now, upon this latter point we may express a very confident opinion. The Board may buy the water undertakings if they will accept Mr. Cross's terms; but a new water supply will land the Metropolis in such extravagant expenses that the ratepayers will be perfectly horrified. A new supply of water to London from any source at present accessible would cost from eight to ten millions. Add this sum to that which will be required to purchase the water undertakings as they exist, and you have the cost of the old and the new service. How far the Metropolis would be benefited by a new service, and where it shall come from, we leave others to decide. Whether it shall be a supply from the deep chalk wells in the neighbourhood of London, or whether it should be brought from the North, is a matter of no great moment. For our own part, we prefer the deep-well water, for two reasons—first, that its supply would be cheaper; and next, that the water is much pleasanter to drink. The Metropolitan Board of Works are perfectly welcome to do their utmost to secure the control of the Metropolitan Water Supply, but it will never be allowed. Nothing but a Government Commission can be entrusted with the management of the water supply until we have what some are now earnestly seeking for—a complete Municipality for the whole of London.

The annual meeting of the Sheffield Water-Works Company was held on Monday, the 12th inst. It passed off pleasantly, notwithstanding the fact that a section of the Shareholders are not precisely in accord with the directorate on certain points. There is a silly question about charges for baths, which, of course, should be strictly enforced against all consumers; and there is another as to the payment of rates in advance, which it has been decided the Company should always require. On both these questions a little difference of opinion was expressed at the meeting, but very satisfactory explanations were made, and the Directors evidently maintain the confidence of the proprietary. The dividend at present earned by the Sheffield Company is not large, but there is every prospect that their business will grow as trade improves and the town extends.

The accounts of the water undertaking of the Joint Board of the Stockton and Middlesbrough Corporations have just been audited. The Auditor shows what we knew before, that the undertaking cost the Corporations £842,296. Of this sum no less than £37,882 was wasted in expenses which ought not to have been incurred. The large sum for purchase and the amount for prospective profits could not, of course, have been avoided. The Company only obtained their just rights, and if the amount of purchase-money appears large, we can only say that the terms are such as are generally accepted. The undertaking does not appear to be profitable to the Corporations, for it would seem that, notwithstanding that the water-rates have been raised, there is a deficit of £33,652. Precepts have been issued which only brought in £10,000, leaving the Corporations burdened with a deficit of £23,652. Water is still pumped from the Tees, and the Corporations show little disposition to begin the works which would in time afford a better supply than that which is now obtained from the filthy river.

The Corporation of Wolverhampton are luckier. They took over the works of the Water Company in 1868, and last year made a profit of £1850. The accumulated balances of profits have enabled the Corporation to set aside £5000 for a reserve-fund, which will presently be wanted. It seems that the town of Wolverhampton contains 15,145 houses, of which the Corporation supply only 12,047, showing that 3098 houses are dependent on wells. We are unacquainted with the Water Act of the Corporation, but we imagine that it contains a clause which would enable them to close these wells if it could be shown that the water obtained from them was not suitable for domestic use. We hardly think that in Wolverhampton shallow wells can furnish water fit for domestic consumption. The Corporation are liberal in their dealings with the consumers, for they have already reduced the domestic rate from 1s. 6d. to 1s. 3d. in the pound; but the charge for closets is high (10s. each). A further relief will be given to the ratepayers by the gratuitous supply to the Corporation of all waters required for public purposes, causing a reduction of one halfpenny in the pound on improvement rates.

The Corporation of St. Helen's and the Local Board of Whiston are in difficulties about their water supplies. In the first case, the Corporation seem likely soon to run short of water, and they are, consequently, anxious to secure a further supply. Under the advice of Professor Hull, they fixed upon a site for some new works; but the Local Government Board have disapproved of it, and so the Corporation have to look after another source. Whiston is supplied

by the Rainhill Gas and Water Company with water of which the only fault is its excessive hardness (36°). On this account its use is condemned by the Medical Officer of Health and a considerable number of the inhabitants, the latter complaining that it disagrees with them, and is, moreover, expensive when used for laundry work; and this we can easily believe. Water of 36° of hardness would, we think, be likely to induce dyspepsia, and we are not surprised that medical men at Whiston have occasionally to recommend a change of residence for their patients.

We learn from a letter which will be found in another column that it has been decided to adopt Bischof's spongy iron process for the filtration of the water supplied to the city of Antwerp, the result of experiments carried on for several months past having proved satisfactory enough to warrant the trial.

URBAN WATER SUPPLY.

In continuing our notices on this subject, as given in the recent Return made by the Local Government Board, we propose in the present article to consider the Lancashire and Cheshire towns situated in the basin of the Mersey. This river and its feeders receive the drainage from the western watershed of the Pennine chain, where the rainfall is exceedingly heavy, averaging 38 inches; but the drainage area is not large, owing to the comparatively short run of the tributaries and main streams. On the other hand, the population in these areas is enormous, the urban population averaging nearly 900 per square mile. Although the sources of the streams are in millstone grit and mountain limestone, they flow over large tracts of coal measures and new red sandstone, the whole of the lower part of the main stream being on these rocks, some of the chief feeders flowing over small areas of coal measures before they reach the sandstone. The water supply of the Lancashire towns is much more dependent on a few very large systems, each feeding a number of smaller places, than is the case in other parts of the kingdom. In some instances the cost of works has been enormous, and could only have been undertaken by wealthy Corporations. Although, therefore, the number of towns is greater than in the Severn or Went drainage areas, the separate systems are comparatively few in number.

The Mersey is the name given to the united streams of the Goyt and the Etherow after their confluence near Stockport. The former flows northwards and westwards through Cheshire, and the latter southwards and westwards through Lancashire. Both receive water from the Pennine hills. There are three towns on the Goyt and two on the Etherow. New Mills, the largest of the former, is imperfectly supplied by a private Company from springs. Marple, somewhat smaller, is even less well supplied by old wells, but a water scheme is under consideration. Chapel-en-le-Frith is not mentioned in the Return. On the Etherow is Glossop, a large town supplied at present by a Company. Negotiations are in progress to purchase the works, but no account is given of the source or expense. Mottram is much smaller, and has no works.

Stockport, the first town on the Mersey after the confluence of the Goyt and the Etherow, is partly supplied by a private Company, and, as usual in similar cases in the Return, no information whatever is given. The remaining part of the supply is had from the Manchester Corporation. Stockport supplies Cheadle, Heaton Norris, Moseley, and Northenden. Besides part of Stockport, several places on the Mersey between that town and Lymm are supplied from Manchester. These are Ashton, Didsbury, Flixton, Hale, Mossley, Northenden, Partington, and Stretford. Lymm has water from a private Company. Warrington receives 24 gallons per head per day, drawn partly from wells and partly from a gathering-ground. The works are managed by a private Company. The cost of the works, including those not yet completed, will be equivalent to about £6 per head of the population, and the charge is about 7½d. per thousand gallons. Widnes appears to use (or waste) as much as 65 gallons of water per head per day, and even this is found insufficient. The cost of works is nearly £6 per head of the population, and the charge is only 4·8d. per thousand gallons. The water is obtained from wells in the new red sandstone. Runcorn is also supplied by a private Company from wells in the same rock, and no figures are given.

Of the towns on the Cheshire side of the new red sandstone promontory that separates the Mersey from the Dee, Higher and Lower Bebington are supplied by the Wirral Water-Works Company, who pump from the sandstone into a reservoir. Bromborough is also supplied by the same Company to the extent of 5 gallons per head per day, at a cost exceeding 15d. per thousand gallons, but no account is given of quantity or cost to Bebington. Tranmere has a supply of nearly 33 gallons per head per day from sandstone wells. The supply is nearly constant, but is said to be insufficient, owing to the rapid increase of the population, which is probably larger than is stated. The charge is only 4d. per thousand gallons. Birkenhead receives 27 gallons per head per day supplied intermittently from deep wells, borings, and lodgments in the new red sandstone. The cost of works has been equivalent to nearly £3 per head of the population, and the charge for water averages 5½d. per thousand gallons. Wallasey, now a large place, is supplied in like manner by water from the wells in the new red sandstone to the extent of 54 gallons per head per day, the cost of works having little exceeded £4 per head of the population, and the charge being only 5·8d. per thousand gallons. The supply is constant.

Liverpool, at one time dependent on wells, the water of which, by continuous and exhaustive pumping, has shown clear indications of decreasing in purity, was one of the first of the great northern towns to go out of its district to collect water over a large catchment of rocky surface, and in 1847 the Rivington reservoirs were prepared to collect the rainfall on moors north of Bolton, in the drainage area of one of the tributaries of the Ribble. The noble artificial lakes here constructed are, however, insufficient for the rapidly increasing population, and Parliament is now sought to authorize works to take the waters of the Vyrnwy, an upper tributary of the Severn. The supply averages nearly 23 gallons per head per day. The cost of works does not exceed £4 per head of the population, and the charge is nearly 9d. per thousand gallons. Liverpool supplies the following townships, some of which are in the drainage area of the Ribble:—Allerton, Bootle-cum-Linacre, Garston, Great Crosby, Huyton and Roby, Litherland, Little Woolton, Much Woolton, Prescot, Toxteth Park, Walton-on-the-Hill, Waterloo-with-Seaforth, Wavertree, West Derby. The terms of supply are not stated.

Passing on now to the towns in the drainage areas of the chief tributaries of the Mersey, we take first the Tame. A large catchment area on the millstone grit supplies water collected into reservoirs, and supplied to the following towns in this drainage area:—Ashton-under-Lyne, Stalybridge and Mossley, Hurst, Dukinfield, Audenshaw, and Upper Mill. The total population exceeds 90,000, and there is a constant supply of from 20 to 30 gallons per head per day. The works were purchased from a Company by the joint Local Boards and Corporations of these towns. Stalybridge takes 20 gallons of water per head, and the local cost of works has been about £5 per head of the population. The supply to Ashton-under-Lyne is not stated, but the cost of works has been at the same rate. The charge in Stalybridge is 8½d. per thousand gallons. At Dukinfield, where the cost of works a little exceeds £3 10s. per head, the cost is 8·9d. At Mossley and Hurst, 30 gallons per head are supplied. Upper Mill, though included in the Act with Ashton-under-Lyne and Dukinfield, was not supplied when the Return was made up, the local works not being completed. There are two other towns in the Tame sub-drainage area—Hyde, a large place supplied from springs with 9 gallons of water per head per day; and Hollingworth, a much smaller town, also supplied from springs.

We next come to the sub-drainage area of the Irwell, where the number of towns and the crowding of the population is extreme and unequalled in England. On the upper part of the stream is Bacup, a large town which, we are told, is badly and imperfectly supplied with water. There are reservoirs, but the quantity yielded is not stated. There are also private wells. Oldham obtains its water from the Rivers Medlock and Beal. From 20 to 30 gallons per head per day are supplied under the constant system, at the cost of 7d. per thousand gallons. In addition to its large population, Oldham supplies several townships—namely, the greater part of Chadderton, Crompton, Royton, Failsworth, Lees, and Quickmere. About one-tenth of Chadderton is supplied from Heywood, and Crompton has several local wells. The general works at Oldham have cost £3 10s. per head of the total population, and there are, no doubt, local works of which no account is given, which raise the price of the water in some of the townships. Rochdale is the next town. It is supplied from a large catchment area, the water being collected into reservoirs. The supply is constant, and at the rate of nearly 20 gallons per head per day. The works have been exceedingly costly, averaging more than £8 per head of the population. Castledon, Littleborough, Whitworth, and Wuerdale and Wardle are townships chiefly or entirely supplied by Rochdale. Milnrow is supplied from the same source to the extent of one-third.

Bolton is supplied by a large catchment area, and has several storeage reservoirs, which afford sufficient water for a population of 65,000 persons outside the borough limits. The town itself receives 28 gallons per head per day, the charge being 8½d. per thousand gallons. The outside population, including the townships of Astley Bridge, Farnworth, Kearsley, Little Hulton, Turton, Westhoughton, and part of Leigh, appear to receive the same average quantity, but the charge is not stated. In some of them wells are also used, and part of Leigh is supplied from Manchester. The cost of works at Bolton has not exceeded £4 per head of the population supplied. Bury is another large town supplying several smaller townships—namely, Haslingden, Little Lever, Radcliffe, Ramsbottom, Whitefield, and part of Prestwich. The supply is constant, and averages 21½ gallons per head per day. The cost of works is less than £3 per head, and the charge about 6d. per thousand gallons. No information is given as to the charge or quantity in the outside townships.

Manchester and Salford are at present supplied from extensive reservoirs collecting the water from a catchment area in the Pennine hills, but the Corporation of Manchester are authorized to take the waters of Thirlmere, one of the Cumberland Lakes. It supplies, either directly or indirectly, not less than 40 separate townships, besides the city of Manchester, selling water in bulk to nearly half this number. The townships supplied outside those now included in the boroughs of Manchester and Salford are Barton, Eccles, Winton and Morton, Blackley, Bradford, Chorlton-cum-Hardy, Crumpsall, Denton, Didsbury, Droylsden, Flixton, Gorton, Haughton, Levenshulme, Moss Side, Openshaw, Newton Heath, Prestwich (part only), Rusholme, Stretford, Swinton and Pendlebury, Urmston, and Withington. The towns supplied in bulk are Ashley, Ashton-upon-Mersey, Bollington, Dunham Massey, Godley, Hyde, Northenden, Newton, Stockport (part only), Timperley, Werneth. Altrincham, Bowden, and Sale receive their portion through the agency of the North Cheshire Water Company. Manchester takes 51 gallons per head per day at a charge of 6·3d. per thousand gallons; Salford 15 gallons, at 6½d.; Atherton and some towns associated with it (Tyldesley and Shakerley), 14 gallons, at 9d.

In the sub-drainage area of the Sankey there are three towns in the district of Makerfield—Ashton, Ince, and Newton—all imperfectly supplied from wells in the new red sandstone. At Ashton, the Return gives 24 gallons per head, but the population is now much greater than at the last census. The charge is 4·4d. per thousand gallons. At Ince only 12 gallons are given, at a charge of 8½d.; and at Newton, 5½ gallons, at a charge of 9·6d. At St. Helen's, nearly 40 gallons of water per head are supplied from new red sandstone wells, at a charge of 3½d. per thousand gallons. The cost of works was little more than £2 per head of the population.

In the Bollin sub-drainage area Macclesfield is the chief town. Here 18½ gallons per head per day are supplied from a catchment, the works having cost less than 40s. per head of the population, and the charge being 5d. per thousand gallons. Leigh has been already referred to, being supplied from Manchester; and Bolton, Adlington, and Bollington are supplied by local wells, and have no public works. Knutsford is not referred to in the Return.

In the Weaver sub-drainage area there are several moderately large towns, but few are mentioned in the Return, and of none are there complete notices. Crewe has an intermittent supply from new red sandstone wells; Northwich, a constant supply, averaging 3 gallons per head per day from a brook and wells. Tarporley, a similar small supply. At Nantwich there is a reservoir connected with a lake; at Congleton, wells in gravel; at Sandbach, local wells; and the same at Whitchurch and Doddington. Frodsham is not mentioned in the Return.

From this somewhat imperfect account of the water supply of the towns of South Lancashire and part of Cheshire, it will be evident that there are similar or even more marked differences in quantity and charge than those already noticed in the drainage areas of the Ouse and Trent. In some cases this is due to natural and inevitable causes, while in others it would seem to be the result of accident. On the whole the towns are well supplied, and the quality of the water is good, especially where the sources are hillsides, and when the supply is regulated by reservoirs constructed to retain the surplus. On the other hand, the rivers are of little avail, and, being unfit for domestic uses, have been left to be fouled and injured by the various processes of manufacture for which their waters have been utilized. For the most part the water supply is quite independent of the lower part of the streams that flow through the district.

THE METROPOLITAN WATER QUESTION.

The Vestry delegates, meeting occasionally in the Vestry Hall of St. Martin's-in-the-Fields, under the chairmanship of Mr. E. J. Watherston, have apparently thought it necessary to change their minds in anticipation of the forthcoming change of Ministry. They are looking to a new Parliament and a new Government to give them a new Water Bill, and have consequently revoked their former decision—viz., that it was desirable for Mr. Cross's Bill to be read a second time and sent to a Committee, it being the present opinion of the delegates that the best thing to do with the Bill would be to "throw it in the fire." A month ago the delegates thought that Mr. Cross had made "an honest endeavour" to settle the Water Question, although they deemed the terms of purchase to be excessive. On Friday last, as one gentleman remarked, they met "under altered circumstances," though he did not "wish to talk politics;" and another gentleman declared Mr. Cross had "deceived the ratepayers," though he did not "wish to say it offensively." Despite the appeals of the Chairman and Mr. Beal, the meeting resolved that Mr. Cross's Bill was "entirely objectionable," and it was decided that a memorial should be presented to "the new "Home Secretary, praying the Government, when it comes "into office, to withdraw the Bill." One of the delegates thought it was rather awkward to pass such a resolution in the face of one so opposite in its character adopted only a month before; but the meeting considered this little inconsistency unavoidable, and the new resolution was carried. The Chairman voted against the motion, and so we presume did Mr. Beal, as he spoke against it. The votes were nine for the motion and seven against, so it cannot be said that the delegates were unanimous.

The complaint against the Bill was that the terms were unreasonably high, and that the composition of the Water Trust was bad. Of course, the latter is capable of amendment in Committee. The terms are not thus elastic, and if the Vestries object to the price, they may as well call for the withdrawal of the Bill. Mr. Watherston took great pains to show that the terms were not excessive; but his arguments and figures fell on unwilling ears. Mr. Cross himself would have spoken in vain, even with Mr. Edmund J. Smith at his elbow. The delegates had, doubtless, been taking counsel with their Vestries and District Boards, as also with their friends and supporters, with the result that they could only see some very big figures, which they believed represented very extravagant sums of money. One delegate was convinced that the Companies works were dreadfully out of repair, and would require some millions to put them into good working order. Even Mr. Beal overlooked the fact—we presume he had not heard of it—that Mr. Cross employed Colonel Bolton to examine the works of the several Companies, and to report on their condition, so that any outlay requisite to put them into good working condition should be duly allowed for in carrying out the purchase. Mr. Beal also wanted the capital accounts of the Companies to be audited. We always thought that the capital, as well as the revenue of the Companies, was duly scrutinized by the Government Auditor. But Mr. Beal wished to have the Bill sent to a Select Committee, and he trusted to see it come out of the ordeal so thoroughly changed that its own parents should not know it again. The delegates, or a majority of them, refused to believe in the transforming power of Parliament, and desired to have the legislative bantling strangled at once. New brooms sweep clean, and it was expected that the new Government would produce a better Bill than the old. A great many absurd things were said, and the passing of the resolution rejecting the Bill was an equally absurd act, as the Chairman himself very plainly told the meeting, much to the indignation of one gentleman, who contended that the delegates "were not children."

While this little wrangle was going on at St. Martin's, there was another part of the same drama being performed at Spring Gardens, on the opposite side of Trafalgar Square. Revolutionary elements are apt to gather around the Nelson column, so that we need not wonder that some strange proposals were mooted in these quarters. The Metropolitan Board has done too little and attempted too much, in regard to the London Water Question. It has failed to carry out those powers which Parliament has placed in its hands for the benefit of the water consumers of the Metropolis, and it has busied itself with schemes, in opposition to the Water Companies, which have involved a large outlay of public money to no purpose. What the Board is now going to do is more than the Board itself knows at present. Last Friday, Mr. Selway gave notice that at the next meeting of the Board he would move that it be referred to a Committee to consider and

report as to the advisability of the Board applying to Parliament for an Act to improve the water supply of the Metropolis, the Committee to have authority to confer with Her Majesty's Government on the subject. The last clause is specially needful, presuming it is intended to pave the way for payment of costs. The Board knows perfectly well that it has no power to spend money in the promotion of a Water Bill, but it may hope in some way to get over this difficulty by the assistance of the Government. It is possible that the Board will decline to entertain Mr. Selway's proposition; but from the known position and influence of that gentleman at the Board, it is hardly likely that his proposal will be at once rejected.

We have no doubt that the impending change of Government has exercised its effect on the Metropolitan Board as well as on the Vestry delegates. All are hoping to gain favours from the new Government, such as could not be obtained from the old. Disappointment may follow such expectations, but for the present hope prevails. Concerning Mr. Selway's notice of motion, we observe that it is of a most Protean character. It takes every possible shape, as we pass on from one clause to another. At the commencement it speaks of "amending and regulating the existing Water "Companies." We presume the law is to be amended, and the Companies are to be regulated; but very possibly Mr. Selway is not correctly reported, for he is not apt to err in his use of language. So far, this points to a Regulation Bill; but, unfortunately, the Board has never yet shown a disposition to carry out the regulations prescribed by the existing Act. The next clause of Mr. Selway's motion speaks of "consolidating" the Companies. This would be very well, if properly done. It would tend to economy, and to improved arrangements. The next clause is totally different, and suggests "the providing of an additional supply of pure water." Certainly Mr. Selway cannot think of reviving the defunct scheme of Sir Joseph Bazalgette, Mr. F. J. Bramwell, and Mr. E. Easton, especially as Sir J. Bazalgette declared the other day, when it was proposed to bring sea water to London, that there was no room for any more pipes under the streets of the Metropolis—not even at the West-end. Finally, Mr. Selway speaks of "any other means." Thus he would have the Board meddle with the Water Question in some way or other, though it will be seen he does not propose that the Board shall give its support to Mr. Cross's Bill.

Mr. Selway proposes a conference with the Government. The Vestry delegates, after passing the resolution rejecting Mr. Cross's Bill, decided on meeting at a future date and inviting the Metropolitan members of Parliament to join them in a conference on the Water Question. Something momentous ought to arise out of all this consultation. It is a curious comment on the system of local government in the Metropolis, that after the Vestries and District Boards have elected the members of the Metropolitan Board, they should likewise elect delegates to represent them at a voluntary council. The meeting at St. Martin's-in-the-Fields is—or ought to be—superfluous. We might say it is schismatic. Perhaps we might term it unconstitutional. Happily it has no taxing powers, except that the members may tax themselves to pay the cost of the meetings, the Vestries being pretty generally awake to the fact that they have no right to spend public money on delegates. But, in the absence of all other powers, the delegates have the power of speech, and if they are not altogether Demosthenic in their utterances, they are at least earnest in their efforts to "let the Companies know what they "mean." Among other things, the delegates are going to ask that benevolent body, "the new Government," to bring in "a short Bill" to "bar the Water Companies from any "increased compensation on account of the new valuation "about to be made of the property of the Metropolis." According to the discussion which led to this resolution, the real meaning of the delegates would appear to be that the Companies should not be allowed to charge for the water supply according to the annual value shown by the new assessment. A Government which could entertain such a proposal must not only be less regardful of what are called "vested interests" than British Governments are wont to be, but must also have a supreme contempt for parliamentary enactments. The law provides that the Companies shall charge for the water supply in accordance with the annual value of the premises supplied. The delegates would have the law summarily altered, so that in future the Companies shall not charge on the annual value, but on something less. Speaking mildly, we may say there is in this proposal a lack of propriety which puts it utterly out of court. Yet how can we censure a Vestry delegate for proposing the very same thing which a noble Earl stood up and advocated in the House of Lords? Nothing seems too revolutionary for some people—peers or commoners—when it is desired to coerce a Water Company.

As to the "increased compensation" of which the delegates are afraid, that is inevitable if London is to grow and the new buildings are to be supplied with water by the Companies. The customers are fast increasing, the revenue is growing, the dividends are advancing towards their statutory limit in those cases where it has not yet been reached, and the property of the Companies is yearly augmenting in value. For this reason Mr. Watherston and Mr. Beal urged the delegates to be tolerant towards Mr. Cross's Bill. To get the Bill thrown over would be to lose two years. So said the Chairman; but the delegates refused to believe it, or, if they believed it, they thought "the new Government" would put everything right at last. They would not be content unless the Bill brought forward by Mr. Cross was utterly rejected. "I "hope," said the mover of the main resolution, addressing the assembled delegates, "you will let the Companies know that "there shall be no more speculating on the Stock Exchange "at our expense." This is very grand and defiant, but we were not aware that the speculations on the Stock Exchange took any money out of the pockets of the ratepayers, or were likely to do so. The terms of purchase in the Government Water Bill were framed without any reference to the price of shares on the Stock Exchange, and in this way Mr. Cross's oft-quoted promise to the House of Commons last year was fulfilled in the spirit, though not in the letter.

The estimate of value may be handled in various ways; but Mr. R. Price Williams, in a statement addressed to Mr. Watherston, gives figures to show that if the London Water Companies were at once to charge their full statutory rates, their net income would be directly raised from £773,454 to £1,035,534 per annum—an amount sufficient to pay interest on £29,655,710 of three and a half per cent. stock, which is of itself rather more than the price to be paid according to the terms of Mr. Cross's Bill. Beyond this we have to consider the annual increase, which is an important element in the value. Of course, attempts are made to depreciate the value of the undertakings, one argument being that the present supply is impure, necessitating the introduction of another at great cost, rendering the existing works partly useless. But repeated inquiries by Royal Commissions and Parliamentary Committees have shown that the water supply of London is substantially and practically good. If the ratepayers wish to protect their pockets, they will be on their guard against the notion of a "competing scheme." No project of the kind is likely to be adopted, and the only result of bringing it forward will be to occasion delay in the settlement of the main question. The terms on which the Companies have offered to surrender their undertakings may appear high, yet it cannot be shown that the ratepayers will be losers by accepting the terms. The only objection against the Bill is that the Companies will be large gainers by the transaction. Supposing the Bill rejected, all we can see at present is that the transfer of the water-works to a public authority will be indefinitely postponed, and the ultimate cost to the ratepayers will be increased. One passage in Mr. Watherston's statement to the delegates will scarcely fail of being verified by the course of events. It runs thus: "After taking professional advice, I "am more than ever persuaded that the terms of the Bill "are such as will be of advantage to the public, and that "they are the best which can be hoped for under the circum-"stances of the case." No one has yet shown that the terms of purchase will not be "of advantage to the public;" but the overthrow of the scheme is proposed because the "advantage to the Companies" is thought to be excessive. The impatience which refuses even to let the Bill go before a Select Committee, betrays the vehemence of prejudice rather than the exercise of sound judgment.

SMETHWICK LOCAL BOARD GAS SUPPLY.—At the meeting of the Smethwick Local Board last week, the Clerk read the correspondence which had passed between the Town Clerk of Birmingham and himself relative to the transfer of the gas supply in Smethwick to the Local Board. In one of his letters Mr. Hayes stated that, as the appeal before the Lords Justices in the West Bromwich case had been decided against the Corporation, the Gas Committee did not propose to carry the litigation further. Mr. Hayes added that, in order to save further expense, the Committee would be glad to meet the representatives of the several purchasing Authorities, and endeavour to arrange the terms for the transfer of the gas supply in their several districts. The Clerk said that he had written to Mr. Hayes, asking to be informed the price required by the Corporation for the gas supply of Smethwick, and had received a letter in reply stating that his communication would be laid before the next meeting of the Gas Committee. The Board thereupon instructed the Clerk to write to their Gas Engineer, asking whether it was possible to have the gas-works completed by the end of September next, so that the Board may at that period commence to manufacture the gas required in the district.

LIGHTNING CONDUCTORS.*

This treatise is the most comprehensive and practical work which has yet been published on the protection of edifices from the effects of lightning, and it may be considered as exhausting the subject, so far as the present state of knowledge extends. Its bulk—over 250 octavo pages—would surprise any one who might imagine, as too many appear to do in this country, that the protection of any building from damage during the heaviest thunderstorm may be assured by simply fixing a metallic rod to its highest point, and bringing the end down to the ground. The most cursory inspection of Mr. Anderson's work would convince such persons that the question cannot be so easily settled, and a deeper perusal, while increasing one's appreciation of the many points of difficulty which dearly-bought experience has in many instances forced to the front, also tends to impress on any one who is responsible for the design or safe custody of a large edifice, the absolute necessity that exists for the most complete possible provision for the avoidance of destruction like that which has been caused by lightning in the past, and may be caused again at any moment by the same agency.

Commencing with a voluminous history of lightning conductors, for the better comprehension of which a brief statement of the nature and effects of electrical discharges in general is included, the early experiments of Franklin are described, and the honour which he thereby received from the scientific world of his day is recorded. Yet, as we are told, the world in general was remarkably slow to profit by his greatest discovery, that lightning, the dreaded power which so often reduced the proudest edifices of man to dust and ashes, could be led tamely and harmlessly to earth by a suitably arranged metallic rod. The eventual spread of the Franklin rods, as they were frequently termed, over Europe, and especially over America, is described in readable terms, though with an approach to prolixity which renders one somewhat impatient to reach that portion of the volume which more nearly concerns the practical necessities of the present day. Mr. Anderson, however, evidently loves his subject, and has so scattered his remarks over the whole course of his narrative, that a valuable comment is sometimes to be found among a mass of accompanying historical or biographical matter.

From a long list of trials and failures, Mr. Anderson draws the chief recommendations respecting the materials, proportions, and arrangement of lightning conductors, which it is the main object of his treatise to elucidate and enforce. After much discussion of the relative advantages of all kinds of metals in common use, he is led to prefer copper, in the form of bands or wire rope, but more especially the latter, as the most effectual and cheapest in the end. Citing Mr. R. S. Newall, F.R.S., as his chief authority for the most approved examples in modern practice, he states that copper wire rope, $\frac{3}{8}$-inch in diameter, is the best material for the conducting-rod, which should not be insulated from the building, but, on the contrary, should be connected with any masses of metal occurring in its construction. Every principal gable or turret of a large building should be provided with a rod of this description, terminating at the top in a finial having several points, and at the bottom, or earth connection, every such conductor must be in absolutely perfect contact with the subsoil water, through the intervention of a special anchorage sunk deep in the soil, or by means of the water or gas pipes, which in every large town would make a good earth terminal. Such is, in brief, the gist of the advice which Mr. Anderson has to offer. He insists on the absolute necessity of a good earth connection, without which, as he says, a building provided with the best conductors is worse off than if it had none. And when everything has been done that can be suggested in the appointment of lightning conductors, he asserts that they may, after all, be seriously misleading in the sense of the security which they confer, unless they are thoroughly and periodically tested. After having been long in position, the conducting power of the best apparatus may become much impaired by decay or accidental injury, frequently to the earth terminal, and, therefore, probably unperceived until after irreparable damage has been done.

Some of Mr. Anderson's remarks have special interest for gas and water works managers, irrespective of the general application of his warnings to them as to other custodians of important structures. The utilization of the gas and water mains as earth terminals for lightning conductors is a matter upon which the proprietors of those articles may reasonably ask their professional advisers for an opinion, and upon which the latter need be well informed, since it is improbable that any application of the kind would be permitted if any danger might, however remotely, be expected to arise therefrom. Mr. Anderson is only able to cite a single instance in which a water-pipe was damaged by lightning, and even in that case, which is given on the authority of Father Secchi as having occurred at Alatri in 1872, the main was not actually in contact with the conductor; but the earth terminal of the latter was at no great distance from it, so that a flash of extraordinary power, failing to find sufficient connection at the proper place, leaped across the intervening space to the water-pipe, cutting in its passage a trench nearly 11 yards long and 28 inches deep, and broke the pipe which it first struck, melted the lead caulking of the next joint, and showed traces of its action at both ends of the line of main. Father Secchi, however, does not ascribe this violent action to the mere passage of the electrical discharge, but considers that the interruption which it encountered, and the resistance offered by the earth, were sufficient to develop heat enough to raise the water which was actually in contact with it into steam at extremely high pressure, which consequently exploded with extraordinary energy. Had the conductor been originally in contact with the pipe, the charge would probably have been dissipated quietly and harmlessly. In this case, however, the pipe appears to have been buried at no great depth in soil which had become very dry after a hot summer. In this country, as in France and America, street-mains are in general so deeply laid that they are mostly, at some parts at least, in earth which is always sufficiently damp to fulfil the requirements of a good terminal, and no risk is to be dreaded from conducting by their agency the most violent discharges of electricity to earth.

The presence in buildings of large quantities of metal tubing for gas and water is also liable to cause abnormal electrical states which might lead to disastrous results, unless such piping is in all cases connected with the lightning conductors. This is a point that deserves attention, for instances have been recorded where a discharge of electricity has taken place between an insufficient conductor and the nearest gas-pipe, which has consequently been perforated and the gas ignited.

The structures commonly found in gas-works are, by the nature of their construction, generally sufficiently protected from much risk of damage by lightning. Gasholders, and buildings with iron roofs, connected, by rain-water and other metallic piping, with the moist subsoil or the underlying network of mains, are cases in point, although all buildings, and particularly chimneys, should be specially provided with good lightning conductors.

The reality of the danger and its general imminence may be easily appreciated by referring to the statistics of life and property destroyed by lightning which are given by Mr. Anderson, who specially describes over 300 cases. This list might be almost indefinitely extended if it were necessary, but we have probably said enough to induce any one wishing for full information on this important subject to consult the comprehensive treatise under notice.

* "Lightning Conductors: Their History, Nature, and Mode of Application." By Richard Anderson, F.C.S., F.G.S., Member of the Society of Telegraph Engineers. London: E. and F. N. Spon.

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

SPENCE'S METALLIC COMPOUND AND ITS USE FOR PIPE-JOINTS.

Sir,—From the correspondence in your columns on the so-called Spence's metal, it appears that this compound is generally considered to be a new invention. This is, however, by no means the case, an identical substance having been invented and patented under the name of "ferreine" in 1856.

B. F. Ortet, the original patentee, says in his specification: "My invention consists in treating iron pyrites either alone or in combination with iron ore, or sulphur, or products containing sulphur, by which I produce a substance which I call ferreine, which is susceptible of being moulded."

The method of manufacture is ingenious, and might possibly be employed to utilize the sulphur concentrated in the purification of gas. He describes it as follows:—"I employ two boilers of a given capacity, connected by a tube adapted to their lids. In one of these boilers I place yellow iron pyrites, or other product containing sulphur, such as the sulphurets, but by preference the natural sulphuret of iron, on account of its abundance at a cheap price. In the second boiler I place powdered iron pyrites or iron ore. The fire under the first boiler being lighted, the pyrites is melted, and the sulphur (about 15 per cent.), given off under the influence of heat, distils over to the second boiler, heated to a low temperature, by means of which the sulphur combines with the iron ore in the second boiler, and produces a bi-sulphuret of iron, which I term ferreine."

By another method the patentee produces the same substance by adding sulphur to the pyrites; and it will be seen, on referring to Spence's specification, that the substance now usually associated with his name is essentially the same as Ortet's ferreine, although, of course, this substance may have been re-discovered without knowledge of Ortet's invention. However, as ferreine has now been known 24 years, and the inventor mentions its use for pipes, it is highly probable that it possesses some defect, or it would not have been so completely forgotten.

Brixton, April 12, 1880. W. F. Reid.

THE BRAY LANTERN AND BURNER, AND MR. SUGG.

Sir,—I have to ask your permission to make a few remarks concerning Mr. Sugg's defence, in your last issue, against the charge that he is infringing my first lamp patent, No. 1454 of 1879, and imitating my large slit-union burners used therein. Mr. Sugg's defence is that the burners he used were patented by him in 1874, No. 4277 (or 4227 ?). That means that he was then familiar with, and supplied slit-unions under that patent of, say, 40, 60, 80, and 100 candle power. The fact is, the slit-union (or hollow-top) is never mentioned in that patent, and is not shown in the drawings. But the gas world knows well that before January, 1879, when I first made them, slit-union burners of such power had never been heard of; and Mr. Sugg, having now begun to supply them, is imitating my burners—that is, following my lead—the same as I should be imitating his enlarged Argands if I were now to begin to make them.

Regarding my lantern, Mr. Sugg's defence is ambiguous; but among other things he says "that if he (the writer) will search in the records of the Patent Office under date Jan. 27, 1879, he will find his invention anticipated by me." Why is the number of the patent not given? The most striking features in my invention are the steadiness and brilliancy of the flames. Those effects are produced by causing a column of air to pass up the centre of the lantern, at a suitable speed for the purpose, and placing therein flat-flames, "singly, doubly, or in clusters." The lantern Mr. Sugg has produced carries out my principles, and, what is more, by means of a lantern (not the simple form I now use), the parts of which are all to be found in my first patent. But this is the invention which Mr. Sugg says his patent anticipates. If it did, it is strange that I have been allowed to go on infringing his rights

till now; and equally so that he has waited till I have made a success of it, even against his Argand, before putting in an appearance with it. The claim is an absolute myth. Your readers will be astounded to learn that Mr. Sugg has no lamp patent at the date given, nor could I find one, though I looked carefully through the whole of January and February; and further search leads me to the conclusion that he has taken out no such patent during the remainder of that year.

I have now finished with this subject, so far as your columns are concerned, and will only add, for the information of those interested in the subject, that I shall promptly resist any infringement of my patent rights.

GEO. BRAY.

Blackman Lane, Leeds, April 17, 1880.

SPONGY IRON FOR FILTERING THE WATER SUPPLY OF TOWNS.

SIR,—The question of Water Supply being now of such general interest, will you allow us to state in the JOURNAL that we have recently proved the practicability of using "spongy iron" for the purification of water by water-works? This you will see from the following letter addressed to the inventor of the spongy iron process:—

"3, *Whitehall Place, London, S.W., April* 7, 1880.

"Gustave Bischof, Esq.,

"Dear Sir,—We see no objection to your announcing, in any way you please, that the results of experiments on a considerable scale for several months have proved so satisfactory that we have decided on adopting spongy iron for the Antwerp Water-Works, which are now in course of construction.—We remain, yours truly,

(Signed) "EASTON AND ANDERSON."

With reference to the purification of water by filtration through spongy iron, we need only refer to a few of the official statements made on the subject. In the Sixth Report of the Rivers Pollution Commission, p. 221, we read: "Under the influence of this material, Thames Water assumes the chemical character of a deep-well water." From the Army Medical Report for 1877 we extract: "This is a very powerful filtering substance. . . . The water filtered shows no tendency to favour the growth of low forms of life, and may be stored with impunity; water may also be left in contact with the medium for an indefinite period without undergoing any deterioration" (p. 171).

THE SPONGY IRON WATER PURIFYING COMPANY.

505, *Oxford Street, W., April* 9, 1880.

THE MANUFACTURE OF SULPHATE OF AMMONIA.

SIR,—The letter of your correspondent, Mr. G. E. Stevenson, the Engineer and Manager of the Peterborough Gas-Works, published in your last issue, would have passed unnoticed by me but for the concluding paragraph, in which I am charged, by implication, with failing to provide for the safety of the workmen under my control, and neglecting the adoption of such apparatus and methods of working as will best combine practical efficiency and financial economy.

The "saturator" employed at the Chesterfield Gas-Works is not an "open" saturator, as described by your correspondent, but a closed one; and, furthermore, it is connected by a large flue with a chimney exceeding 100 feet in height, and far away from the scene of operations. The minimum vacuum on the apparatus, caused by the draught in the chimney, is ¾-inch of water gauge, which is capable of removing all traces of gases liberated during the operation of manufacturing sulphate of ammonia. The only time atmospheric air is admitted into the apparatus is when the sliding shutter is opened to effect the removal of the salt. This is but for a short period, and the aperture being a small one, no "noxious fumes can make their exit from the saturator" against the pull of a ¾-inch vacuum. To those practically acquainted with sulphate-making on this system it is known that the "noxious fumes" are given off in the early stage of the process, and not when the salt is formed. For the purpose of adding the sulphuric acid, no necessity whatever exists for opening the saturator, and instead of the cover, or the top of it, "being removable and not sealed down," as erroneously stated by your correspondent, who says "it must be open," it is a fixture, with the flue before mentioned attached thereto; the sliding shutter being on the side of the vessel, and not on the top. The sulphuric acid can be added by means of a covered feed-tank and a pipe, by simply turning a tap and allowing the fluid to run into the saturator in such quantities as may be required. By neglecting his duty, and throwing the apparatus open, the unfortunate man Kelly, contrary to orders and to practice, chose to violate the rules of the establishment by pouring 3 cwt. of concentrated sulphuric acid into the mass of boiling ammoniacal liquor, and had partly succeeded in adding the contents of a third carboy, when the carbonic acid gas was evolved in such quantity that the flue could not remove it as fast as it was given off, and the result was suffocation.

This description of apparatus was never designed to cope with such an exceptional volume of CO_2 with the sliding shutters open, any more than locomotive engines are intended to cross rivers without the aid of bridges. Had, however, the aperture been closed, or the acid added *viâ* the feed-tank and pipe, all the gas would have been at once swept away into the chimney, and there decomposed by heat. But these unfortunate men did not use the feed-tank specially provided for their safety; but, guided no doubt by Kelly, preferred to court danger even unto death in the manner described.

The value of the statements of Mr. G. E. Stevenson can be appreciated by readers of the JOURNAL by referring to the loose diction of the first paragraph. For instance, we are informed that "doubtless the apparatus in use at these works is complete and perfect of its kind," and immediately after your correspondent desires to point out that "the apparatus is defective." If his statement that the evaporating system is the best be simply his opinion, we can accept the same at its true value; but if, on the other hand, it is meant to convey the conviction that it is really the best system that can be adopted, I for one emphatically contradict the assertion, and say it is not.

Your correspondent confidingly informs us that he has adopted the Coffey still at Peterborough, and he also mentions two other places where it is in operation. It may surprise him to learn that this system has been in use for some 40 years, and is by no means new. In the year 1841 the application of Mr. Coffey's still, with a few modifications to adapt it to the distillation of "gas water," was patented, and it does not even now appear to be universally in favour amongst sulphate of ammonia manufacturers. I myself had experience with the Coffey still 13 years ago, and am familiar with its advantages and disadvantages; and, for "practical efficiency and economy," I prefer the system which your correspondent condemns.

After the inquest upon, and interment of these unfortunate men, with a view of demonstrating that the apparatus was in perfect order, and not at fault, I donned some old clothing, and took up the manufacture from the point where it was left by the deceased "brewer," Patrick Kelly. With the same materials as he had at his command, I produced sulphate of ammonia of excellent quality, and extracted all the free and fixed ammonia out of the liquor. The following day I "brewed" again with great success, obtaining the maximum quantity of salt, and the apparatus has been in daily operation ever since, without any structural or other alteration, and no accident has happened, or can happen, if only the commonest care is exercised. This is, I think, as much as can be claimed for the Coffey still and evaporative process.

By those who know me personally, I doubt not I shall be readily acquitted of the serious charge of indifference to the welfare of my workmen, or of failing "to provide for their safety;" and with regard to the "efficiency and financial economy" of my management, let the working results, and the dividends of the Company for the last few years, answer.

Of the Ipswich accident I shall not attempt to speak, having no personal knowledge of the circumstances. I, therefore, leave your correspondent to Mr. Goddard, if that gentleman should think the "foeman worthy of his steel."

CHARLES EDWIN JONES.

Chesterfield Water-Works and Gaslight Company, April 16, 1880.

SIR,—As a Manufacturing Chemist, and also a witness in the shocking accident at the Chesterfield Gas-Works on the 22nd ult., I desire to remind Mr. G. E. Stevenson that I very fully described to the jury the apparatus in use, and he will find that I stated there was a flue erected upon the top, to carry away the gases to the chimney or flue. This flue is always under partial vacuum, which I can say, from personal inspection, is a very strong one.

The Coffey still mentioned by Mr. Stevenson was introduced 40 years ago, and I cannot subscribe to his doctrine that the evaporating system (spoken of by Brande prior to 1836) or the Coffey still is preferable to the one now in use at Chesterfield.

Having had the honour of Mr. Jones's acquaintance for some years, I am satisfied that if any engineer of gas-works has the interests of his *employés* at heart, it is Mr. Jones; and I regret the tone of your correspondent's letter. The uniform excellent quality of sulphate produced at the Chesterfield Gas-Works is quite sufficient evidence of the Engineer's intimate knowledge of chemistry, and his care and caution in the *modus operandi* is too well known in Chesterfield to be questioned.

EDWARD J. OLIVER.

The Sheffield Chemical Company, Attercliffe, Sheffield, April 16, 1880.

A COUNTRY MANAGER writes as follows:—"Sir,—Some years ago I purchased from a Company a small gas-works erected for the purpose of supplying a village situated in two counties, a river dividing one from the other. I am now in this difficulty: There is over the river a bridge on which is laid the gas-main, and this bridge is about to be removed to make room for a new structure. During the erection of it, a temporary bridge is to be thrown across; and, of course, I must divert the main for the time, and carry it across the temporary bridge or otherwise. Now, I should be glad to know if I can come upon any one for the expense of doing this, or how I ought to act. I have seen the contractor, and he says that in his estimate he has not made any provision for things of this sort; and that, as the top of the bridge is to be built in solid concrete, he does not think the surveyor will allow me to put the main on the bridge again at all. I think permission was obtained from the Highway Board before laying the mains; but I am not quite sure on what conditions the work was done."

[Perhaps some of our readers can cite cases, to a certain extent, similar to the one above described; and state their mode of proceeding. —ED. J. G. L.]

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

THURSDAY, APRIL 15.

(*Before Vice-Chancellor* MALINS.)

BUENOS AYRES GAS COMPANY AND BOWER *v.* WILDE.

In this case, which has been standing over for some time, partly on account of the general election,

Mr. HIGGINS, Q.C., said he had to move for an injunction to restrain the defendant, Mr. Wilde, from issuing a certain advertisement which had appeared in the daily newspapers, and more conspicuously as a page advertisement in the JOURNAL OF GAS LIGHTING, where it was headed "Caution," and warned the public and investors in gas shares that the property of the Buenos Ayres Gas Company was not liable to make good the debentures of the Buenos Ayres Gas Company, Limited, a further issue of which had been announced by the plaintiff Company. He (Mr. Higgins) stated that the limited Company which he represented was formed on April 30, 1875, and it was not only a *bonâ fide* Company, but a very important one.

The VICE-CHANCELLOR asked if it was carrying on business.

Mr. HIGGINS replied that certainly it was, and lighting the city of Buenos Ayres to a considerable extent.

The VICE-CHANCELLOR further asked if it was making profits.

Mr. HIGGINS said he believed so. There was no question of that sort raised; it was a perfectly *bonâ fide* and important Company, which had been registered for five years under the name it now bore. The defendant was agent in England of a Buenos Ayres Company with a Spanish name, which had been in business longer than the plaintiff Company, but had never been registered. It was a rival Company in Buenos Ayres, and was no doubt also a respectable Company. He did not desire

to say anything against it on that ground. They said they were known colloquially in England as the Buenos Ayres Gas Company, which might be the case, but they were never known as the Buenos Ayres Gas Company, Limited. Before the case came into court the plaintiffs were willing to do anything to avoid litigation, and would have been willing even to change their own name if they could have done so safely; but it was found that if they altered their name here it would create difficulties in Buenos Ayres, where it would be supposed that they had come to an end, or something of this sort. The question was whether the defendant, who was the agent of a rival Company, had a right, when they advertised their debentures, to put a notice into a special journal, stating that the holders of these debentures would have no resort to the assets of the Buenos Ayres Gas Company.

The Vice-Chancellor remarked that the advertisement was in its terms strictly true, he supposed.

Mr. Russell Roberts said it was perfectly true. There was no malice unless it could be found in that statement.

Mr. Higgins said the truth of it made no difference if it did injury to the plaintiffs. The question was whether the plaintiffs had been damaged, and the evidence showed that the advertisement had prevented them issuing the debentures. The Buenos Ayres Gas Company was not the proper name of the defendant Company.

Mr. Roberts said it was the name under which it made contracts in England. Its real name was the Compagna de Gaz, Buenos Ayres, of which the English name was an exact translation.

Mr. Higgins then proceeded to read the statement of claim, which set forth the origin and constitution of the Company. They had 80 miles of mains in Buenos Ayres, and lighted about 3000 out of a total of 5000 gas-lamps. The defendant Wilde carried on business in Liverpool, and was the agent in England of a Company, the name of which seemed to vary in different places, and under different circumstances. It was the oldest of the four Companies which supplied Buenos Ayres with gas, but it was not an English Company, and was not registered as such. The plaintiff Company had power to issue £200,000 of debentures, and wished to issue the remainder of that quantity. Mr. Bower, the plaintiff, held a great many of the debentures, some of which he wished to realize, and he caused an advertisement to be inserted in the Journal of Gas Lighting, offering for sale at par £4000 of the first mortgage debentures. The defendant then issued the advertisement he had before mentioned, occupying a whole page of the Journal, and the statement, although literally true, was calculated to convey an impression contrary to the truth, to injure the sale of the debentures of the plaintiff Company, and also to injure its credit. The learned counsel was about to read the affidavit of the Secretary of the Company verifying the above statements, when

The Vice-Chancellor asked if it was really worth while to continue this advertisement.

Mr. Glasse, for the defendant, said it had never been continued. The plaintiffs were moving long after it had ceased.

The Vice-Chancellor asked if there was any existing order or undertaking.

Mr. Higgins said there was an existing undertaking not to insert any more advertisements until the motion was disposed of.

Mr. Glasse said he gave this undertaking long ago.

Mr. Higgins said if this undertaking were continued until the hearing he should be satisfied.

The Vice-Chancellor said it was a curious advertisement. Company A proposed to sell some shares, and the other Company gave notice that those who bought them would have no claim on Company B. It did not look very good-natured. However, an undertaking had been given not to continue it.

Mr. Glasse said if he continued his undertaking, the other side ought to undertake not to continue their advertisement.

Mr. Higgins said he should do nothing of the sort.

Mr. Glasse said at any rate there must be the usual undertaking as to damages, and

Mr. Higgins acceded to this.

The matter thereupon stood over to the hearing, when the question of costs will be disposed of, unless an arrangement is made in the meantime.

SURREY SESSIONS.—Monday, April 12.

(*Before Mr.* W. Hardman, *Chairman, and a Bench of Magistrates.*)

APPEAL AGAINST A CONVICTION FOR ILLEGAL USE OF GAS.

The case of the *Phœnix Gas Company v. Walter* was set down for hearing this day, on the defendant appealing against a conviction by Mr. Chance at the Lambeth Police Court, who ordered him to pay a fine of £20 for burning gas belonging to complainants without the consent of the Company (see *ante*, p. 281).

Mr. Mann appeared for the appellant, and Mr. Besley with Mr. Horace Avory for the respondents.

According to the statement of counsel, supported by the evidence of Mr. Allen and Mr. Jarrett, representing the Company, the appellant took a furnished house at Hethrington Road, Clapham, which respondents supplied with gas. On hearing of the change of tenancy, the Company required a deposit, which the respondent refused to pay, and the supply was consequently cut off. Shortly afterwards they found that he had re-connected his fittings with the Company's pipes, without their knowledge or consent, and consumed more than 7000 feet of gas.

Upon this evidence the Court affirmed the conviction with costs, and ordered immediate payment, with the alternative of a month's imprisonment with hard labour.

Scarborough Water Supply.—The Scarborough Town Council, who recently purchased the undertaking of the local Water-Works Company, have of late had under consideration the question of procuring soft water from Harwood Hill, for which the Company obtained an Act in 1876—the same year as the Act authorizing the purchase by the Corporation was passed. It has now been determined not to carry out this scheme, but to sink another deep well, and to pump water from the oolitic measures. The quality of the water is similar to that already supplied to the town. A boring-hole has been put down to the depth of 100 feet, near to Seamer Junction, and the water overflows at the surface of the ground at the rate of 400,000 or 500,000 gallons a day. It is beautifully bright, but is considerably harder than is generally thought desirable in other towns. Machinery capable of elevating a million gallons a day is about to be provided, and a new reservoir on the same level as the existing one at Osgodby Hill, which will supply the greater part of the town, will also be erected. In order to ensure a more efficient supply to the various parts of the South Cliff district, another reservoir will be constructed near the summit of Oliver's Mount. The total cost of these works will be about £20,000, and when completed the water supply in every part of the town will be most ample, and the pressure good throughout. The plans have been prepared, and the alterations are being carried out, under the superintendence of Mr. E. Filliter, the Engineer to the Leeds Corporation Water-Works.

Miscellaneous News.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held at Tottenham, on Saturday, the 10th inst.—Mr. James Brickwell in the chair.

The Secretary (Mr. J. Randall) read the notice convening the meeting, and the following report of the Directors was taken as read:—

The Directors submit to the Proprietors the report and accounts for the half year ended the 31st of December.

The profit and loss account shows a net profit of £4791 8s. 2d., which enables the Directors to recommend the maximum authorized dividends to be paid—namely, 10 per cent. on the original £5 shares, and 7 per cent. on the new ordinary capital; and after making a further addition of £500 to the reserve-fund, which now stands at £4000, there remains a balance of £790 19s. 2d. to be carried forward.

The works continue to be maintained in very efficient condition.

The large increasing demand for gas necessitates a further considerable outlay for new mains, tenders for which are invited, and an early appeal to the Proprietors will be made to furnish the necessary funds, of which due notice will be given.

The Directors regret to announce that the declining state of Mr. Black's health has compelled him to resign his seat at the Board, and the Directors, considering it to the interest of the Company, immediately filled up the vacancy thus created by the appointment of Mr. James Warren, of Capel House, Enfield.

Dr. *Revenue Account, for the Half Year ended Dec.* 31, 1879. Cr.

Coals, including carriage, &c.		£6,184	3 10	Sale of gas—		
Purifying materials and sundries		290	4 5	63,224,100 feet at 4s. 3d. per 1000 feet, less discounts	£13,369 5 6	
Salary of Engineer		250	0 0	Public lighting and under contract	1,386 10 0	
Wages, &c., at works		1,243	19 5		£14,755 15 6	
Repairs and maintenance of works and plant, less old material sold		3,093	5 10	Rental of meters	435 11 2	
Salaries of Inspectors and Clerk		159	10 0			£15,191 6 8
Repair and maintenance of mains and service pipes		887	14 9	Residual products—		
Repairing, renewing, and re-fixing meters		152	10 1	Coke, less £254 2s. 8d. for labour and cartage	£1,837 10 1	
Lighting and repairing public lamps		306	18 0	Breeze	94 7 5	
Rent of siding		27	10 0	Tar	723 10 11	
Rates and taxes		673	19 7	Ammonia and liquor, less £103 15s. 4d. for acid	887 17 9	
Directors allowances		375	0 0			3,543 6 2
Salaries of Secretary and Clerks		287	10 0	Transfer fees		2 12 6
Collectors commission		136	1 4			
Stationery and printing		43	12 2			
General establishment charges and incidentals		152	0 7			
Auditors		35	0 0			
Law charges		2	2 0			
Interest on deposits for gas		24	3 3			
Bad debts		56	8 5			
Total expenditure	£14,381	4	8			
Balance	4,356	0	8			
	£18,737	5	4		£18,737	5 4

The Chairman moved, and Mr. J. Liddle seconded, the adoption of the report, which was agreed to.

Mr. Corbet Woodall moved—"That a dividend at the rate of 10 per cent. on the original capital, and at the rate of 7 per cent. on the new ordinary capital, for the half year ending Dec. 31, 1879, as recommended by the Directors in their report, be now declared payable."

This was also agreed to; and the meeting closed with votes of thanks to the Chairman and Directors, the Secretary, and the Manager.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health on the Composition and Quality of the Metropolitan Waters in March, 1880:—

Names of Water Companies.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen— As Nitrates, &c.	Ammonia. Saline.	Ammonia. Organic.	Hardness (Clark's Scale). Before Boiling.	Hardness (Clark's Scale). After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	22·04	0·056	0·165	0·001	0·010	16·0	3·8
West Middlesex	21·87	0·056	0·150	0·000	0·008	15·8	3·8
Southwark and Vauxhall	21·24	0·032	0·150	0·000	0·006	16·5	3·3
Chelsea	22·95	0·032	0·150	0·002	0·005	15·8	3·8
Lambeth	23·17	0·028	0·150	0·000	0·007	16·0	3·8
Other Companies.							
Kent	33·19	0·004	0·435	0·000	0·003	21·2	5·6
New River	22·03	0·040	0·150	0·000	0·006	16·0	3·3
East London	23·93	0·028	0·150	0·001	0·006	17·0	3·8

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours.

The water was found to be clear and nearly colourless in all cases but the following, when it was slightly turbid—namely, Lambeth Water Company. C. Meymott Tidy, M.B.

The following is Dr. Frankland's report on his analyses of the water supplied to London during March:—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Kent, 1·5; Colne Valley, 1·5; Tottenham, 1·6; New River, 3·4; West Middlesex, 4·2; Chelsea, 4·4; Grand Junction, 4·5; East London, 4·8; Lambeth, 5·3; Southwark, 6·4. The Thames water supplied by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was of somewhat better quality than in February, but the Southwark Company's water was still unfit for dietetic purposes, being much polluted with organic matter. The best water from the Thames was sent out by the West Middlesex Company, but the great improvement in this Company's water, noticed since the renewal of their filters in November last, has nearly disappeared, and this water is now only slightly better than that of the Chelsea and Grand Junction Companies. All the Thames water was efficiently filtered before delivery. The Lea water, delivered by the New River Company, was of much better quality than any of the Thames waters; but that distributed by the East London Company was inferior to three out of the five Thames waters. Both these Companies sent out efficiently filtered water. The deep-well water supplied by the Kent and Colne Valley Companies, and by the Tottenham Local Board of Health, was of its usual excellent quality for dietetic purposes, and that sent out by the Colne Valley Company was suitable for all

domestic purposes, having been softened before delivery. Seen through a stratum two feet deep, the waters presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colourless; New River, clear, very pale yellow; East London, Chelsea, West Middlesex, and Grand Junction, clear and pale yellow; Lambeth and Southwark, clear and yellow."

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Matters.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrates and Nitrites.	Total combined Nitrogen.	Chlorine.	Total Hardness.
Inner Circle.								
Thames—								
Chelsea	31·12	·225	·034	0	·239	·273	1·5	19·1
West Middlesex	30·90	·221	·026	0	·257	·283	1·5	20·3
Southwark	30·36	·328	051	0	·258	·309	1·7	19·7
Grand Junction	29·28	·227	·059	0	·210	·249	1·5	19·1
Lambeth	31·68	·269	·013	0	·228	·271	1·7	20·0
Lea—								
New River	29·40	·174	·031	0	·277	·308	1·6	19·7
East London	35·92	·243	·043	0	·222	·265	1·8	21·4
Deep wells—Kent	40·38	·076	·015	0	·432	·447	2·5	25·1
Outer Circle.								
Colne Valley	15·00	·070	·016	0	·324	·340	1·4	7·1
Tottenham Local Board	41·00	·078	·019	·094	0	·096	2·9	21·5
Corporation of Birmingham*	26·14	·137	·048	·003	·319	·369	2·0	13·6
Corporation of Glasgow†	2·90	·158	·017	0	·008	·025	0·63	1·2

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
† Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

The Registrar-General publishes the following table in reference to the water supply of London during March. According to the returns furnished to him by the Metropolitan Water Companies, 136,331,201 gallons, or 619,415 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily; or 235 gallons (106·8 decalitres), rather more than a *ton* by weight, to each house, and 33·2 gallons (15·1 decalitres) to each person, against 32·7 gallons during March, 1879.

Companies.	Number of Houses, &c., supplied in Mar. 1879.	Number of Houses, &c., supplied in Mar. 1880.	Aver. Daily Supply of Water in Gallons* during March, 1879.	Aver. Daily Supply of Water in Gallons* during March, 1880.
Total supply	557,774	579,126	129,561,232	136,331,201
From Thames	263,721	277,326	65,954,316	69,280,779
„ Lea and other Sources	294,053	301,800	63,606,916	67,050,422
THAMES.				
Chelsea	29,562	29,945	8,581,900	8,453,300
West Middlesex	51,771	53,917	10,099,458	10,710,676
Southwark and Vauxhall	82,797	89,188	23,085,273	23,650,294
Grand Junction	38,989	40,825	11,035,985	12,212,109
Lambeth	60,602	63,451	13,151,700	14,254,400
LEA AND OTHER SOURCES.				
New River	127,839	129,792	26,628,000	27,392,000
East London	118,910	122,746	29,343,000	31,551,500
Kent	47,304	49,262	7,635,916	8,106,922

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for March, 1880, as compared with that for the corresponding month of 1879, shows an increase of 21,352 houses, and of 6,769,969 gallons of water supplied daily.

EXHIBITION OF GAS APPARATUS AT LEICESTER.

An interesting exhibition of gas cooking and heating apparatus, held under the auspices of the Corporation of Leicester, who recently undertook the management of the supply of gas and water in the town, was opened to the public on the 12th inst. The exhibition was held in the Floral Hall, the galleries of which were occupied by the numerous exhibits, which were from all the well-known makers of gas-cooking appliances, and were so arranged as to enable visitors to examine the merits of the articles of one exhibitor without attention being diverted by those of his neighbour.

The inaugural ceremony was performed by the Mayor (Mr. J. Bennett), and there was a large attendance of ladies and gentlemen. In his opening remarks, the MAYOR said the progress of science, as applied to business and domestic life, had received a wonderful impulse during the past half century, and the result had often been manifest in the saving of labour and the increase of personal convenience. The great principle of the division of labour, which was the motive power in advancing civilization, had been pushed to the front, and, instead of aiming at universal knowledge, men directed their attention to specialities, and to perfection in the minutest points. It was in this spirit that the present exhibition of gas apparatus had been arranged. The Chairmen of the Gas and Water Committees (Mr. Downing and Alderman Paget) and the promoters of the enterprise were convinced that both gas and water might be usefully applied to many more purposes than those for which they had hitherto been generally available, and they thought that this fact could be best brought to the public notice by having a collection of the various appliances connected with this matter in the building in which they were assembled. To make the exhibition successful, and to prove that the appliances were easily available, it would be necessary to show that they could be used with economy. The appeal to the pocket was always a telling argument, and if it could be shown that, by means of gas, joints might be cooked or bread baked in summer time for half the cost of a coal fire, a brisk demand for gas-stoves would be inevitable. Gas was cleaner than a coal fire, which on a hot day in July could most certainly be dispensed with. If manufacturing operations, too, could be carried on by the aid of a gas-engine of from 2 to 3 horse power with greater ease, less room, and less cost than an engine worked by steam, the former would be sure to be adopted. The cheapness of gas depended, however, upon whether the supply was turned off as soon as the demand for it ceased; and therefore all must remember, if they felt inclined to make use of any of the various kinds of cooking apparatus exhibited, that the question of consumption and consequent cheapness depended entirely upon themselves. If suitable arrangements were made, many a workman might be gratified by having a hot instead of a cold dinner, and with the help of the School of Cookery, have his meals comfortably and economically provided. From a social standpoint, therefore, the promoters of the exhibition might claim for it that it was likely to prove a decided gain. In addition to the gas apparatus there were some ingenious contrivances for pumping and cleansing water. Water was indispensable to life, and its absolute purity was a growing necessity. Water should not be allowed to run to waste, and the various arrangements of water-fittings, taps, &c., exhibited were intended to show the amount of ingenuity that had been displayed in guarding against the needless consumption of water. After experiments had been carefully made as to the respective merits of the different gas-stoves, it was intended to let out on hire to consumers those which were found to be best in principle, so that any persons who during the summer might like to test their efficiency would have an opportunity of doing so.

Mr. DOWNING (the Chairman of the Gas Committee) observed that notwithstanding other towns had preceded Leicester in the matter of exhibitions of gas apparatus, the Gas Committee were exceedingly glad to be in a position now to hold one. They had, however, been waiting for the completion of the new gas-works, which were in successful operation. That gas might be brought into greater use in the future than it had been in the past, everybody would be prepared to admit; and when its cheapness, as compared with coal, for cooking purposes, was considered, he hoped benefit would be derived from the exhibition. The Gas Committee were anxious, now that they possessed large works, to find an outlet for the gas manufactured; but if they could not confidently recommend its use for cooking purposes, and could not say positively that it would effect a saving—especially during the summer—they would certainly have hesitated to institute the exhibition. They, however, had abundant testimony that it would do this, and he hoped those present, and others in the town, would be induced to investigate for themselves the merits of the apparatus, and see if they could not in the future more appropriately use the privileges which the exhibition introduced to them. They were deeply indebted to Mr. Charles S. Robinson—and the town generally were indebted to him—for the assiduity he had displayed and the energy he had devoted to the exhibition, and their thanks were also due to the exhibitors.

Alderman PAGET (the Chairman of the Water Committee) briefly alluded to the share the water department occupied in the exhibition.

Mr. C. S. ROBINSON assured those present that the duties he had discharged in connection with the arrangements for the exhibition had given him very great pleasure indeed. The difficulty had been to act with strict impartiality to all the exhibitors, and if the Exhibition Committee had succeeded in doing this they would be perfectly satisfied. The object of the exhibition was primarily for the advantage of the Corporation gas department, as well as for the benefit of the consumers; but if they only obtained a result in this direction, without at the same time putting something into the pockets of the exhibitors, the Committee would be very much disappointed.

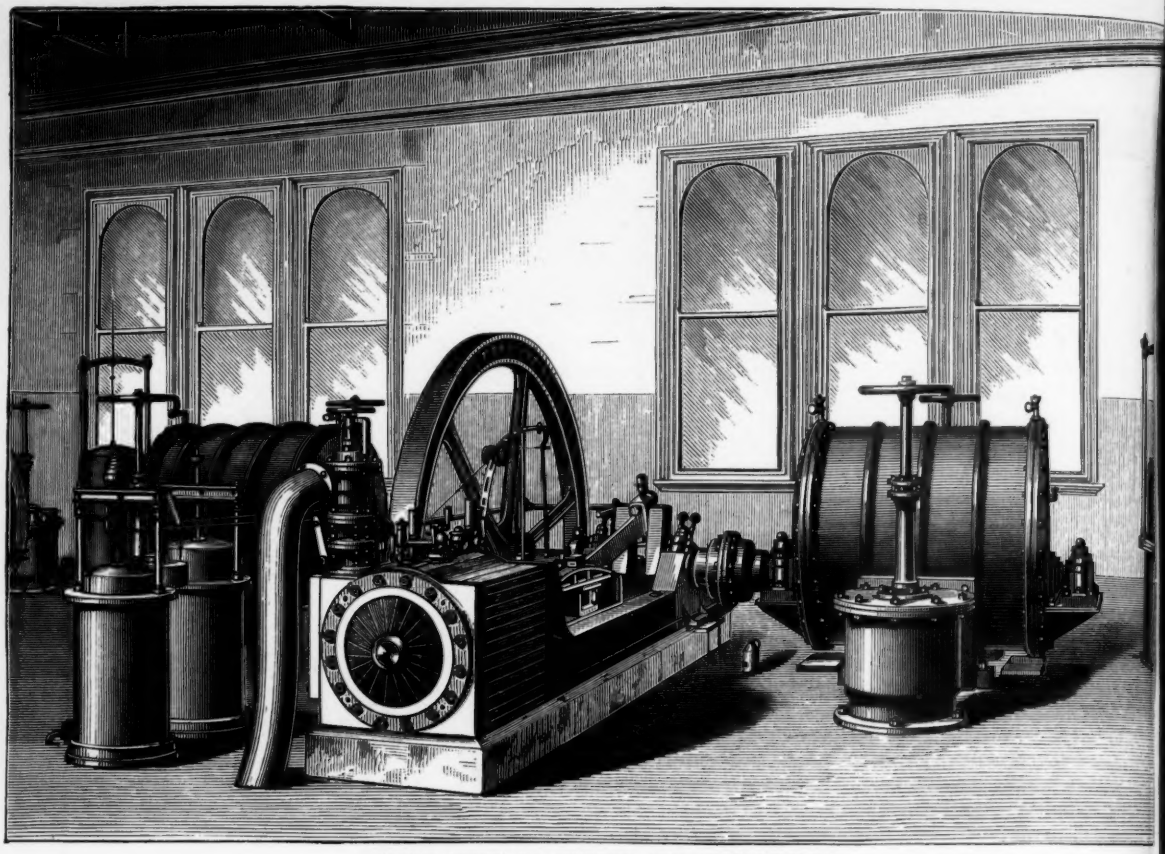
After a few other observations, the MAYOR formally declared the exhibition open, and the company dispersed to inspect the exhibits. Of these, cooking stoves formed by far the larger number. Of course, the most extensive show was made by the well-known makers, such as Messrs. Leoni and Co., Wright and Co., Beverley and Wylde, Billing, Davis and Co., and Siddaway and Sons, all of whose articles were of the quality usually associated with their names, and were exhibited in every variety. Some excellent stoves were, however, shown by makers who are perhaps not so well known. For example, Mr. Williamson, of London, exhibited a few most useful stoves, capable of doing almost every kind of cooking, yet so ingeniously contrived as to allow of their easy conversion into heating apparatus by the substitution of a copper reflector for the roasting appliances. The use of atmospheric burners allows of the maximum heating power being obtained from the gas, while none of the products of combustion are allowed to enter the oven. West Brothers, of Battersea, also had a good collection of apparatus; and so had Hassall and Singleton, of Birmingham, who showed a combined gas and coal stove—the Birmingham range—which possesses much merit as a cooking appliance. Stark and Co., of Torquay, exhibited a stove constructed on a new principle, by which a high temperature may be created and maintained with a small consumption of gas, efficient ventilation being at the same time secured. The waste in cooking with this stove was stated to be very small indeed. The same may be said of an excellent little stove invented by Mr. G. Goldsmith, of Leicester, and exhibited by Messrs. Guest and Chrimes, of Rotherham. Here the ingenious arrangement of the stove enables the maximum amount of heat to be utilized, so that, though small, the apparatus is capable of rendering good service in a household. The ironing stoves, too, shown by this firm were designed by Mr. Goldsmith, and are very economical articles, as the consumption is reduced to a minimum by lifting off the iron, which also turns on the gas by being replaced. In our opinion, however, the most attractive display was made by Mr. Bellaers, of Leicester, whose goods had a nicely-finished appearance. He does not aim at anything great, but his "Auckland" cooking stove possesses so much excellence that it gained for him a prize medal at the recent Nottingham exhibition. His cylindrical heating stoves, with white or copper reflectors, are also really useful and well-made articles.

Among the exhibits which had for their object the utilization of gas for other than cooking purposes, those shown by Mr. C. J. Ward, of Nottingham, and Mr. J. Fielding, of Salford (comprising soldering-iron stoves, ironing stoves, dental reflector, gas irons, &c.), may be mentioned; while the instantaneous water heaters and gas baths of Messrs. Ewart and Son, and Siddaway and Sons attracted considerable attention. Messrs. Guest and Chrimes showed one of Goldsmith's safety gas-lamps for purifying-houses and other places where explosions are liable to occur when a naked light is burning, and also one of the same gentleman's patent sight water-line indicating gas-meters, a large number of which, we hear, are in very satisfactory operation in Leicester. With these meters one of the unavoidable objections to wet meters is obviated, for the inspector can tell at a glance if water is required, and does not, as is usual, have to add water periodically, even if the meters already have sufficient. It is, therefore, claimed that inspectors time is saved as well as inconvenience to consumers.

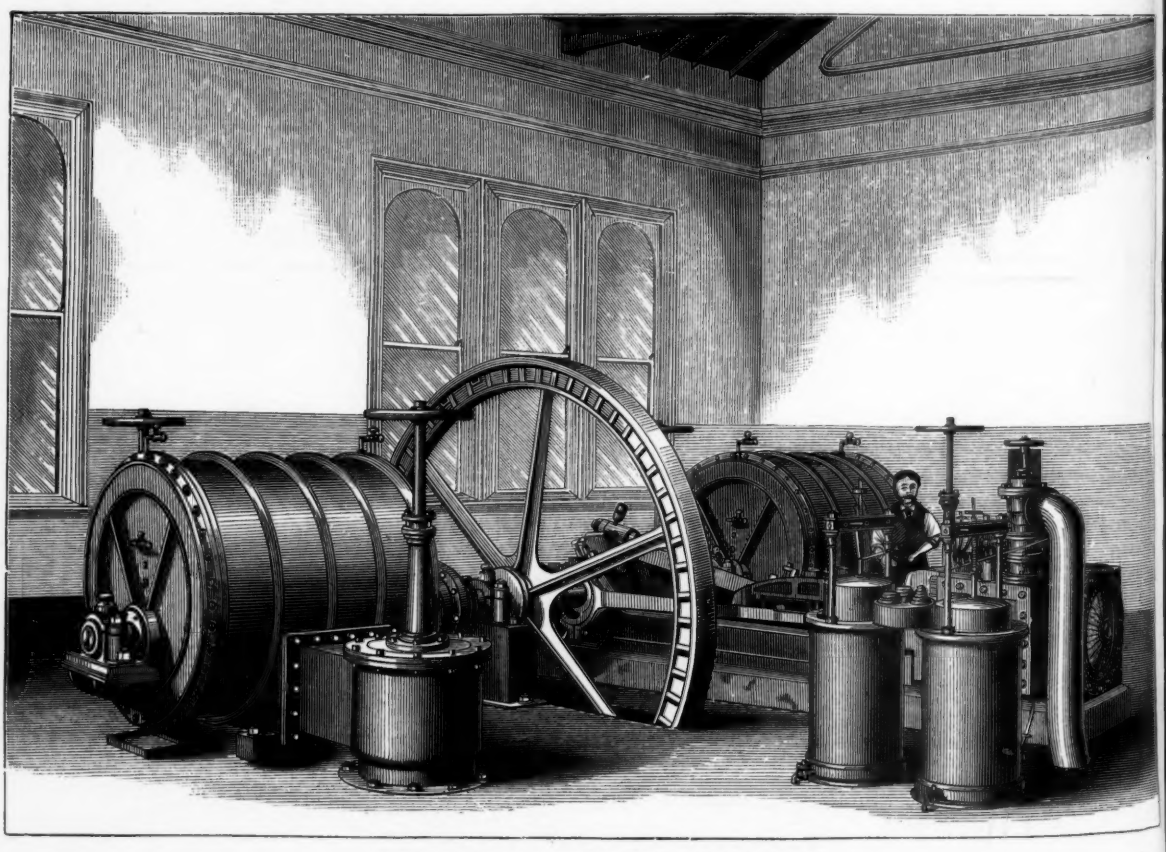
The economic consumption of gas for illuminating purposes was well exemplified by the several varieties of burners on the stands of Mr. W. Sugg, Messrs. G. Bray and Co., Messrs. G. E. Webster and Co., &c., &c.

The water fittings forming a part of the exhibition consisted of a good display of cocks and valves, lavatories, waste preventers, and similar articles by well-known makers.

The exhibition would scarcely have been complete if no attempt had been made to show how gas might be used for furnishing motive power as well as heat and light. At one end of the hall, therefore, the visitors had an opportunity of seeing at work three gas-engines—one a 2-horse power patent silent "Otto," shown by Messrs. Crossley Brothers, of Manchester; another, a 2-man power "Bisschop," shown by Mr. J. E. H. Andrew, of Stockport; and the third, a patent balanced vertical gas-engine, exhibited by Messrs. C. Linford and Co., of Leicester. The two former engines are now so widely known, and their respective merits have so well recommended them to the public, that not a word need be said here in their praise. Messrs. Linford's engine, on the other hand, is a comparatively



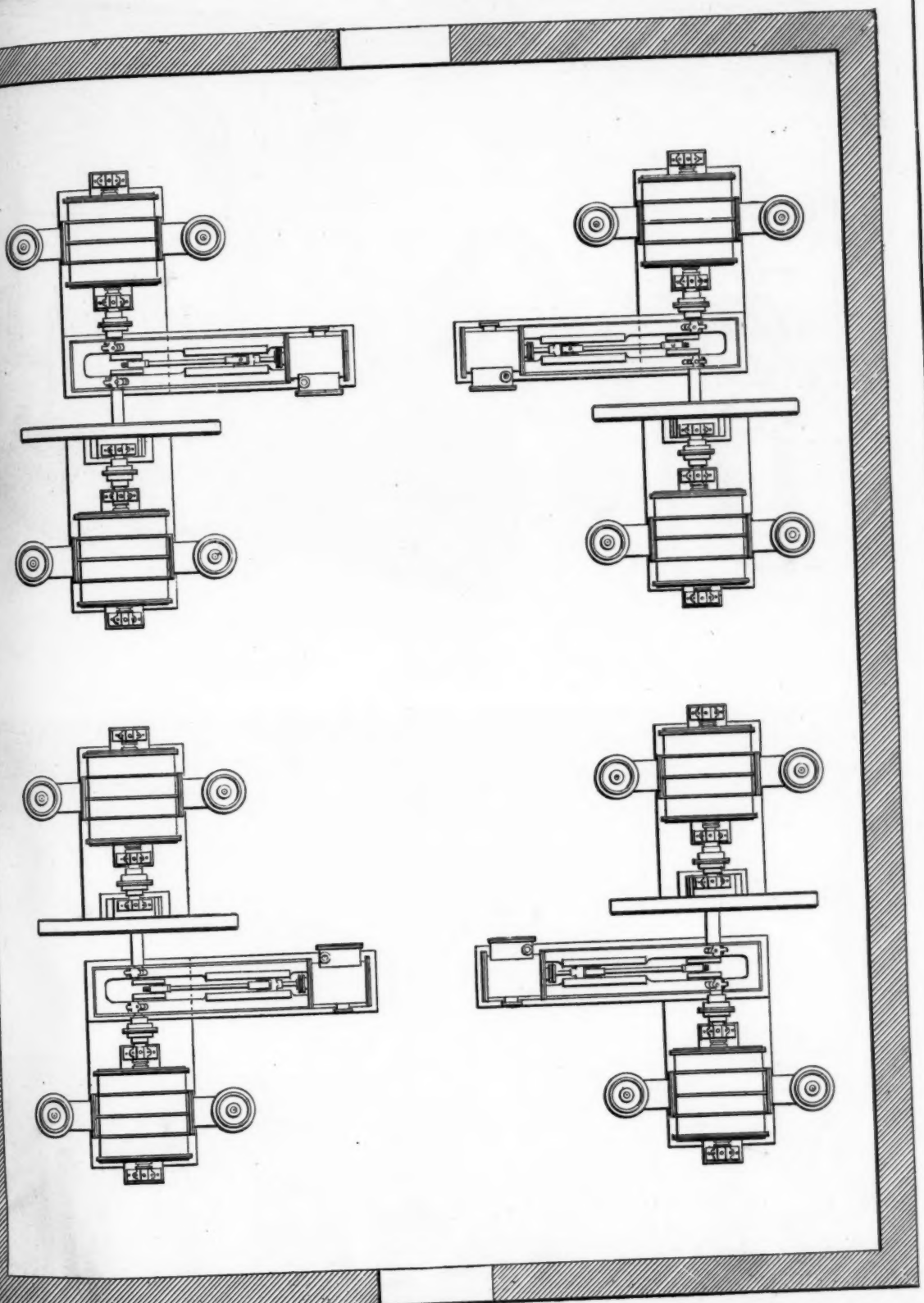
FRONT VIEW OF ENGINE AND EXHAUSTERS.



SIDE VIEW OF ENGINE AND EXHAUSTERS.

APPARATUS FOR PUMPING GA

DESIGNED BY Mr. G. C. TREWBY, M. Inst. C.E.; AND MANUFACTU



PLAN SHOWING THE GENERAL ARRANGEMENT OF THE EIGHT 250,000 FEET PER HOUR EXHAUSTERS AND THE FOUR 40-HORSE POWER NON-CONDENSING STEAM-ENGINES.

FROM BECKTON TO LONDON,

BY Messrs. BRYAN DONKIN & CO., OF BERMONDSEY, LONDON.

new comer, and as such deserves some attention. It has two pistons in a working cylinder, and the power is applied between the pistons, driving them from each other, and actuating a double crank with a shaft in the centre, each crank-arm being half as long as the crank of a single-piston cylinder. The cylinder being open at either end, the pistons may be easily removed for cleaning, there being no covers to take off; there are no stuffing-boxes, or glands in the engine, and no joints to leak. The force on the pistons being balanced, the main shaft bearings are entirely relieved of all the consequent friction, and only the friction from the actual amount of power transmitted remains. The operation of the engine is as follows:—Upon the charge being ready for lighting, a slide-valve which works on one side of the cylinder brings up a light, and ignites the charge, which drives out the pistons, and the power is transmitted by a new and novel arrangement to the cranks, which are arranged to operate in a suitable manner. This form of engine is said to possess several advantages. Great durability is gained by its ease of action, owing to its entire exemption from unequal strains, the main bearings having only the weight of the moving parts to support, and the pressure being uniform, the wear will be equal all round. The engine works quite smoothly, and as regularly as a steam-engine; it is almost noiseless, and possesses the advantage of control of speed, which may be adjusted to a wide range, varying from 120 to 200 revolutions per minute, without any shock or jar to the floor upon which it stands. The design of the engine renders it specially suitable for use where space is an important consideration; and, no foundations being required, a considerable item in the fixing of most engines, which operate upon a diverse principle to this, is altogether dispensed with. The engine shown was a 3-horse power one, having a cylinder 6 inches in diameter with a 14-inch stroke, and the gas consumed did not exceed 50 feet per hour. It is, perhaps, not so pretty—if such a term may be allowed—in appearance as some of the other gas-engines we have seen; however, it is not by this quality that it will be judged, but by its working capacity. It enters the market upon its qualifications for doing its work, and we think it bids fair for public patronage. The inventor claims to be the first in this or any other country who has introduced this novel form of gas-engine, which is the outcome of years of study and labour. The engine is covered by three patents (1878, 1879, and 1880), and we have been informed that at the request of several of the leading townsmen, the makers have consented to call it the "Leicester Gas Motor."

It should be mentioned, in conclusion, that no professional gentleman was appointed to pronounce judicially on the relative merits of the exhibits; but each exhibitor was allowed the privilege of having his goods tested by the Corporation officials, and a certificate was given setting forth their capabilities. This was the plan adopted at the Leeds exhibition last year, and it appears to have given general satisfaction at Leicester, as did the general arrangements of the exhibition, which were, as we have already stated, carried out under the personal superintendence of Mr. Charles S. Robinson, one of the Gas Engineers to the Corporation.

The exhibition remained open during the whole of last week, and was attended by a large number of visitors, especially in the afternoons and evenings; and it is to be regretted that an unfortunate accident which occurred on Wednesday last (through some defective work on the part of an exhibitor, and not from any negligence of the officials), by which a stall attendant, the son of the exhibitor, was rather badly burned about the face, should even for a brief period have marred what we cannot help thinking was an exhibition upon the success of which the Corporation of Leicester and all concerned may fairly be congratulated.

RIO DE JANEIRO GAS COMPANY, LIMITED.

The Fifteenth Annual General Meeting of this Company was held at the Cannon Street Hotel, on Wednesday, the 7th inst.—Mr. BARTLETT JAMES in the chair.

The SECRETARY (Mr. T. Dawson) having read the notice convening the meeting, the following report was presented:—

The Directors, in accordance with the Articles of Association, paid on the 17th of July last an interim dividend of £18,750, on account of the Company's operations up to the 25th of the preceding March, the date of the expiration of the old contract; on the 11th of October last they paid another interim dividend of £18,750, both being free of income-tax, and at the rate of 10 per cent. per annum on the paid-up capital of the Company; and they have now the pleasure of submitting to the Shareholders the annexed statement of accounts for the year ending Dec. 31, 1879, showing a balance at the credit of profit and loss account of £114,101 17s. 10d., reduced by the above mentioned interim dividends, and by the transfer of £5000 to the insurance and contingency fund on the 25th of March last, to £71,601 17s. 10d.

Out of this sum of £71,601 17s. 10d., the Directors recommend that a dividend at the rate of 10 per cent. per annum, also free of income-tax, be paid for the half year ending Dec. 31 last. This will reduce the available balance to £34,101 17s. 10d., which the Directors have disposed of as follows, viz.:—They have placed £50,000, being 2 per cent. on the paid-up capital of the Company, to a new account, called the "amortization-fund," as hereinafter explained; £6000 to the reserve-fund, for equalization of dividends, and £10,000 to the insurance and contingency fund, and have carried forward to the next account the remainder, say £3101 17s. 10d., out of which the income-tax for the past year has been paid.

The necessity for an ample reserve in the "amortization-fund" will be as evident to the Shareholders as it is to their Directors, in view of clause 28 of the new contract. That clause provides that the contract, even after ratification by the Brazilian Legislative Chambers, may be rescinded should the Government decide at the end of 15 years to adopt the electric or any other light. As such rescission could only take place in the event of the electric or some other system of lighting becoming so perfected as to supersede gas either totally or in great part, evidently the value of the Company's plant and works would thereby suffer a serious depreciation, to meet which the Directors wish to set aside annually out of profits 2 per cent. upon the present capital of the Company, to form, with the accruing and accumulating compound interest, a fund sufficient to meet, at all events, a large proportion of the depreciation referred to. And in order that the moneys composing this fund should be entirely exempted from any losses which might arise if they were invested or remained in the Company's business, the Directors propose to invest them, together with their accruing dividends, in undoubted securities, such as Consols or first-class British or Indian railway debenture or guaranteed stocks. Should no such rescission take place at the end of the first 15 years, the amortization-fund can remain available for the expiration of the Company's contract at the end of the term of 33 years, the annual percentage allotted to that fund out of profits being either diminished or discontinued, as may be decided by the then Directors and Shareholders. The Directors would here remind the Shareholders that whether the present contract terminates at the end of 15 or of 33 years, in neither case are the Brazilian Government under any obligation to purchase the works as they were under the old contract.

The Directors call attention to the new mode of stating the Company's assets, which is in conformity with the valuations made by the Government Engineers, such assets having been reduced by £77,264 19s. 6d., which is deducted from the old reserve-fund and insurance and contingency fund; the former being thereby extinguished, and the latter reduced to £43,741 18s. 6d., but afterwards increased to £53,741 18s. 6d. by the addition of £10,000 already referred to, whilst the new reserve-fund for the equalization of dividends stands at £6000.

The expenditure on No. 3 gasholder and new mains having exceeded by £78 16s. 11d. the £150,000 capitalized, such excess has been debited to profit and loss.

The Directors congratulate their fellow-Shareholders upon the favourable results of last year's operations, assisted as they have been by an increased consumption of gas over the preceding year, an improved demand for coke, and the still low prices of coals and rates of freight.

Mr. G. M. Clements, who had kindly consented to join the Board temporarily during an emergency, retired immediately upon that emergency passing away.

Mr. Alexander D. MacGregor is the retiring Director in accordance with the Articles of Association, and, being eligible, offers himself for re-election.

His Excellency Viscount de Maná, having tendered his resignation, ceased to be a Director, and his colleagues have much pleasure in recording their appreciation of the very valuable services, both here and in Rio de Janeiro, which he rendered to the Company during the many years that he was on the Board.

Mr. John Hollocombe, a duly registered Shareholder, who resided for many years in Brazil, and is thoroughly acquainted with the language and business of that country, having been invited to become a Director, has accepted the invitation, and already joined the Board. The Directors have also invited to join the Board Mr. William Henry Holman, whose services to the Company have been very valuable ever since its commencement, but more especially as Head Manager, which responsible post he has filled for the last 13 years (and still retains) to the entire satisfaction of the Board, who consider that his usefulness will be much increased by his thus becoming their representative in Rio de Janeiro—a necessary position formerly so ably filled by His Excellency Viscount de Maná. The Directors still await Mr. Holman's reply.

The Auditor, Mr. Harding (of the firm of Messrs. Harding, Whinney, and Co.), also retires, and offers himself for re-election.

On the 23rd of April last the Directors issued a circular informing the Shareholders that a telegram had been received from Rio de Janeiro, to the effect that an Imperial Decree had been signed approving of the terms of a new contract with this Company; on the 5th of May last they issued another circular, informing them that the contract had been signed with the Imperial Brazilian Government; and on the 4th of June last they sent a third circular, handing a translation of the said contract. During the last session of the Brazilian Legislative Chambers this contract passed successfully through two readings in the Chamber of Deputies, but has yet to pass the third, as also the required three readings, in the Senate, or Upper Chamber, after which it will become law—a consummation which the Directors sincerely hope will be arrived at during the next session. Meanwhile the Company's operations are conducted under the terms and conditions of the new contract.

DR.—*Balance-Sheet, for the Year ending Dec. 31, 1879.*

To Capital, 37,500 shares of £20 each, fully paid up						£750,000 0 0
Reserve-fund			£10,000 0 0			
Insurance and contingency fund—						
Balance brought forward from Dec. 31, 1878	£106,006 18 0					
Amount carried to this fund on March 5 last	5,000 0 0					
			111,006 18 0			
			£121,006 18 0			
Less difference between the value of the assets as they stood in the Company's books on March 25, 1879	£732,705 14 8					
And the value *per contra* according to the Government estimates	655,440 15 2					
			77,264 19 6			
			£43,741 18 6			
Carried to this fund			10,000 0 0			
					53,741 18 6	
Reserve-fund					6,000 0 0	
Amortization-fund					15,000 0 0	
Sundry creditors in Rio and London					793 6 9	
Dividend warrants still unpaid					808 2 0	
Bills payable					2,895 7 2	
Profit and loss—						
Balance of profit brought forward from Dec. 31, 1878			£3,297 4 1			
Less income-tax for 1878			2,279 12 11			
			£1,017 11 2			
Net profits for the present year			113,084 6 8			
			£114,101 17 10			
Deduct, carried to insurance and contingency fund on March 25 last			5,000 0 0			
			£109,101 17 10			
Deduct, carried to insurance and contingency fund	£10,000 0 0					
Ditto, to amortization-fund	15,000 0 0					
Ditto, to reserve-fund	6,000 0 0					
			31,000 0 0			
					78,101 17 10	
					£907,340 12 3	

CR.—*Balance-Sheet.*

By Sundry assets, being value of the Company's property in Rio de Janeiro, according to the valuations made by the Government Engineers, say—	Rs.	dols.			
1. On Oct. 25, 1878, fixed plant	5,303,512	104	£596,645 2 3	£596,645 2 3	
2. On Nov. 6, 1878, mains and pipes in course of being laid	92,077	020	10,358 13 4	10,358 13 4	
3. On Nov. 6, 1878, stores and necessaries on hand and on the way	628,098	970	70,661 2 8		
	6,023,688	094	£677,664 18 3		
Less value of stores and necessaries included in item No. 3, but since consumed, viz.—					
7600 tons of coals	£18,525 0 0				
Shipments afloat	3,699 3 1				
			22,224 3 1		
			£655,440 15 2		
New works executed by order of the Government under clause 30					699 13 11
Stock of stores, &c., in Rio de Janeiro					44,415 4 1
Coals					12,548 0 0
Gas-fittings					3,932 18 10
Sundry debtors, being gas and coke consumers at Rio					60,472 5 11
Office furniture					134 11 6
Shipments afloat					11,439 4 3
Bills receivable, in hand					55,112 13 2
Cash in London					72,357 12 0
Cash in Rio					1,724 13 0
Interim dividends of July 17 and Oct. 11 last on £750,000					37,500 0 0
					£907,340 12 3

The CHAIRMAN said: Gentlemen, in rising to propose the adoption of the report and balance-sheet, I regret having to refer to the absence of our worthy Chairman, Mr. A. D. MacGregor, who has been prevented from attending to-day by a serious illness. Your Directors have endeavoured to make their report to you as full and as explicit as possible. Nevertheless, I will refer briefly to one or two points which I think will be interesting. In the balance-sheet we have deducted from the original cost of our plant and mains no less a sum than £77,264 19s. 6d. You are aware that previous to the termination of our old contract, the Brazilian Government, under clause 30 of the contract, ordered a valuation to be made of our property. The appraisers named were two Brazilian Engineers who bear the highest character in their own country; and although I have not the pleasure of knowing them personally, I heard, when in Rio, a good report of them from all quarters. They proceeded to the valuation with every care and strictness, and I am convinced they performed their task in a thoroughly conscientious manner. We did not hesitate, therefore, in taking their figures as the real value of our property, and seeing that the plant has now been working for 25 years, their valuation bears out what we have all along assured you, that our works and mains have always been

kept in a thorough state of efficiency. This deduction reduced our insurance and contingency fund to £43,741 18s. 6d. It became necessary, therefore, to add to it without delay, which has been already done to the extent of £10,000, making the present balance £53,741 18s. 6d. As regards the new fund, which we have called the "amortization-fund," you will all no doubt concur with your Directors that it becomes an absolute necessity. Science in our days makes such wonderful strides, that no man can foresee what may occur in a few years time. Our new contract stipulates that we shall have the preference, on equal terms, in any new system of public lighting, but our plant may, nevertheless, be reduced very considerably in value, and this depreciation must be provided for. Our working last year embraced three months under the old contract, and nine months under the new one. The profits were satisfactory; but, as stated in the report, they were mainly due to fortuitous circumstances. You will have noticed that our late Chairman, the Viscount de Mauá, has retired from the Board, and that Mr. A. D. MacGregor has been elected in his place. I cannot allow this opportunity to pass without bearing testimony to the eminently valuable services which his Excellency the Viscount has always rendered to our Company, and I can assure you that his advice and influence were of the utmost value to me during the negotiations which were carried on in Rio de Janeiro for the renewal of the contract. I will here say a word regarding Mr. Holman, whom the Directors have invited to a seat at the Board, with a view to his also acting as our representative in Brazil; and I have the greatest pleasure in assuring the Shareholders that his zeal and dedication to our service cannot be exceeded. Our new colleague, Mr. John Hollocombe, has resided in Brazil ever since his youth, and his co-Directors have no doubt that his experience of the business of the country will be very valuable to them. As stated in the report, our new contract has still to pass a third reading in the Chamber of Deputies, and the customary three readings in the Senate, before it becomes law. During the last few days we have learned that a change of Ministers has taken place in Brazil, and we understand that the Legislative Body will meet early in May; but the Board rely on the spirit of justice which has always characterized the public men of Brazil. These are the few remarks I judge it necessary to make, and in conclusion I propose—"That the report and balance-sheet be received and adopted."

Mr. J. H. James seconded the motion, and it was unanimously agreed to.

The Chairman: The next resolution is—"That a dividend of 10 per cent. per annum, free of income-tax, be declared for the year ending the 31st of December."

Mr. Howard seconded the motion, which was carried unanimously.

The retiring Director and Auditor having been re-elected,

Mr. Pelly said: I think we ought all to admit that we are under great obligations to the Viscount de Mauá for the services he has rendered to the Company from the very commencement to the present time, and I therefore propose that we should not only acknowledge this in the report, but pass him a vote of thanks for his service.

The motion was carried unanimously, and the Chairman briefly returned thanks on behalf of the Viscount.

Mr. Robertson: I beg to propose a vote of thanks to the Chairman and Directors for their extreme care and good management of our property during very trying circumstances. The amount of business tact, prudence, and firmness combined which they have displayed in bringing this Company into its present successful condition entitles them to our warmest thanks.

Mr. Pelly seconded the motion, and it was carried unanimously.

Mr. Howard, on the part of the Board, thanked the Shareholders for the vote of approval which they had passed. The best endeavours of the Directors had been exerted, he said, on behalf of the Company, and he could only assure the Shareholders that those endeavours would not be relaxed in the future.

The proceedings then closed.

THE SEWERAGE OF ABINGDON AND TORQUAY.

At the Meeting of the Institution of Civil Engineers on Tuesday, the 13th inst.—Mr. W. H. Barlow, F.R.S., President, in the chair—the first paper read was on the "Abingdon Sewerage," by Mr. Charles Foote Gower, M. Inst. C.E.

Being under notice to desist from any longer discharging the sewage of their town into the River Thames, the Authorities of Abingdon called upon Mr. Bailey Denton, M. Inst. C.E., in the year 1874, to advise them as to the best means of dealing with the sewage, so as to satisfy the requirements of the Thames Conservators. Mr. Denton having, with the assistance of the Author, made an inspection of the town and neighbourhood, recommended that 20 acres of land should be acquired, for the purpose of cleansing the sewage by intermittent filtration, and gave at the same time a general description of the necessary sewers, pumping-stations, and other works since carried out.

The population of Abingdon was about 6000; but provision had been made, in the construction of the works, for at least 10,000 persons. The normal flow of sewage, when undiluted, was taken at 250,000 gallons per day. The ordinary level of the Thames at Abingdon was 162 feet above Ordnance datum. In flood time it reached nearly 167 feet. The River Ock was kept up for the purpose of working mills at a level of 168 feet. The surface levels in the streets of the town varied from about 170 to 200 feet above Ordnance datum. The subsoil water in that part of the town contiguous to the Thames accorded pretty nearly with the river level—162 feet; but in other parts of the town, previous to the carrying out of the sewerage works, it was regulated by the level of the Ock Mill stream, and the consequence was that it sometimes rose, in wet seasons, almost to the level of the streets, and proved injurious to the health of the inhabitants. The sewers in Abingdon were formerly very inadequate for the duty required of them; they had been retained, however, in connection with the street gullies, to carry off rain water from the streets. The level of the land selected for the purification and utilization of the sewage varied from 165 to 168 feet above Ordnance datum. From the general surface height and contour of the town it was impracticable to bring the sewage on to this land without lifting it from 10 to 20 feet from the invert of the outfall sewer. In the design for the new sewers no rain water was to be admitted except from back yards, roofs, and other surfaces, from which it could not economically be kept out. Having regard to the purification of the sewage, and the necessity for pumping, every precaution was therefore taken to keep the quantity to be dealt with within definite limits. The level of the subsoil water in Ock Street and other places had been reduced by laying separate drains, open jointed, beneath or contiguous to the sewers.

In laying the sewers the joints were caulked with tarred gasket and cement, and in some cases were bedded and surrounded with concrete, or clay puddle, to prevent the ingress of subsoil water or the escape of the sewage into the surrounding soil. Meanwhile, the town having been without a public water supply, arrangements were made for flushing the sewers by inlets from the river, and from other sources. The main outfall sewer from the town was 18 inches in diameter, and was capable of discharging 2 million gallons in 24 hours, being eight times the estimated dry-weather flow of sewage. The secondary sewers in the town consisted of 15-inch, 12-inch, and 9-inch pipes. The lower portion of the outfall sewer was 3 ft. 6 in. in diameter, and served as a reservoir to hold the night-flow of sewage, in connection with the pumping-station. This sewer was at times subject to considerable internal pressure from the sewage collected in it, as well as to external pressure from the subsoil water outside being 8 feet below the ordinary level of the Thames. Each engine could pump 400 gallons of sewage per minute; thus both engines working together would lift above 1 million gallons per day. In connection with the engines, a storm overflow from the pumping reservoir had been provided, to relieve the latter in case of heavy storms, floods, or accidents to the engines. Upwards of 100,000 gallons must flow into the reservoir before any overflow could take place. This provision was more than enough for the night-flow of sewage, if the reservoir was pumped empty at the close of the day.

The cost of the above-described works in the town had been £8750, including a portion of the charge for private connecting sewers, which were executed by the contractor for the main sewers up to the boundaries of private properties on each side of the street. The cost of the engines and pumping-station, including fencing of yard, weighing-machine, and sewage screens, had been £2500, of which sum the engines cost about £800. The annual cost of pumping for the last two years had not exceeded £150; but with an increase of water supply it would probably be somewhat greater. The area of land acquired by the Corporation of Abingdon was more than double what Mr. Denton at first proposed. The farm, with cottage and buildings, was let at an annual rental of £4 10s. per acre, the Corporation pumping the sewage. The works were practically completed in 1877, and from that time, with but little exception, the Thames had been free from Abingdon sewage; the land first received it, and, after passing through the soil, the effluent water flowed into the river. Samples of the effluent were found by analysis to be better in quality than the water of many of the wells in use in the town. The sewers were freely ventilated throughout the town by shafts, which were also used for inspection and flushing. The latter operation had to be put in force at least twice a week, owing to the comparatively sluggish flow, the amount of water used for domestic purposes being very small.

The second paper read was on "The Main Drainage of Torquay," by Mr. George Chatterton, M.A., Assoc. M. Inst. C.E.

The author stated that Torquay, on the northern shore of Torbay, had a population of about 30,000. Previous to 1878 the sewage of the town was discharged into the bay by three outfalls, and was a nuisance at low water and in hot weather. The main sewers were constantly closed at their outlets by the sea, which at high water flowed up a considerable way into the town; many of them were of insufficient capacity, and the ventilation being defective, foul gases were driven into the houses. The scheme described was designed and carried out by Sir J. W. Bazalgette, C.B., V.P. Inst. C.E. Its main features were a high and a low level system of sewers. The high-level sewer commenced near Tor Abbey, and had an outfall at Hope's Nose, the eastern extremity of Torbay. The set of the tide at the point of outfall was from the bay at all times, and at present no sewage could enter the bay. The total length of the high-level sewer was 17,030 feet, and it was 7 feet in diameter for a length of 11,387 feet. The fall was 1 in 1177. The level of the invert at the outfall was 4·16 feet below high water of spring tides. The quantity of water brought into the town daily was 600,000 gallons. The dry-weather flow of the sewers was about 1,250,000 gallons, the difference being caused by the streams, springs, and overflow of wells, which had been taken into the sewers. In constructing the high-level sewer, it was necessary to drive three tunnels—at Waldon Hill, Meadfoot Hill, and Kilmorie Hill respectively. The Waldon Hill tunnel was in Devonian limestone. It was 1150 feet long, the size being 5 ft. 6 in. by 4 feet. It was driven from two open faces, the average progress was 9·12 lineal feet per week from each face. Hand labour alone was employed, and the invert portion was lined with Portland cement concrete. The cost of the sewer completed was £1 16s. per lineal foot. The Meadfoot tunnel was 4458 feet long. The sewer was 7 feet in diameter. This tunnel was in limestone rock for the greater part of its length, but some of it was in soft ground. Hand labour alone was employed. It was driven from four working shafts. The average progress per week from each face was about 15 feet. Where the ground was limestone it was lined with Portland cement concrete 9 inches thick, while the sewer in soft ground was formed of brickwork. The average cost per lineal foot for driving this tunnel was £1 9s., and the total cost of completed sewer £2 10s. per lineal foot.

A new roadway and sea-wall were constructed along the Meadfoot beach, with the sewer under the road. The sewer consisted of a single ring of brickwork surrounded with, and founded upon, lias lime concrete carried down to the solid rock. The sea-wall that was here constructed was 1900 feet long, and was built of random-coursed limestone masonry, backed with rubble. The Kilmorie Hill tunnel was 4564 feet long. The nature of the rock varied greatly. In some places it was an argillaceous siliceous grit, with bands of pure quartz, and extremely hard; in other places it was of a shaly composition, while near the outfall it was limestone. The advance per week by hand labour was so slow that it was found necessary to introduce rock-boring machinery at the open face and at one shaft. The progress in feet per week was increased by using rock-boring machinery at the open face in the ratio of 2·33 to 1, and at the shaft in the ratio of 2·19 to 1. The cost per lineal foot was also increased, but not in a corresponding ratio. Ingersoll rock-drills were used, and the air was compressed by Sturgeon's high-speed air compressors. Dynamite was found to be the most effective and economical explosive; 11 tons of it being used without a single accident. There were 13 ventilating shafts on the high-level sewer. The flow of sewage was continuous, so that sewer gas was not generated to anything like the same extent as in tank sewers. There had been no deposit in the sewer. The low-level system received the sewage of about one-tenth of the population of Torquay. The total length was 5184 feet. Surface water was kept out of the system as far as possible. The low-level sewage was lifted about 15 feet by a water-pressure engine, with pumps in duplicate, worked by a head of 250 feet of water from the town main, and requiring no superintendence.

A contract for the construction of the works was entered into in 1875, but in January, 1876, the contractors suspended operations, having executed work to the value of about £8000. On receiving fresh tenders the Local Board became alarmed. The lowest tender was £75,000, and this did not include the cost of extra work and other items, which would have involved a total outlay of £103,327, while the Engineer's estimate for the same amounted to only £65,000. Under these circumstances the Local Board, acting under the advice of Sir J. W. Bazalgette, determined not to accept any tender, but to execute the works themselves by administration. Mr. G. Phillips was appointed Resident Engineer, and the whole scheme was completed by August, 1878, or in two years and five months from the commencement of operations by the Local Board. The total cost of the scheme to the Local Board was £66,145, a saving to the town of £37,182 by not accepting the lowest tender. The cost of the Kilmorie tunnel was £14,358, or £3 2s. 11d. per lineal foot. Of this amount, the cost of the driving was 74·53 per cent., of the trimming 15·98 per cent., and of the lining 9·49 per cent. The rock-boring machinery cost £1395. The execution of the works had involved a rate of about 7d. in the pound on the present rateable value.

BRAY'S BURNERS AND LANTERNS FOR STREET ILLUMINATION.

The accompanying illustrations show the burners and lanterns as manufactured by Messrs. George Bray and Co., of Leeds, for improved street-lighting purposes—the system which they advocate being, as our readers well know, an arrangement of large flat-flame burners in a specially constructed lantern. The system Messrs. Bray and Co. are introducing, though it may be said to be of only very recent date, has been tried by the public authorities of many of the principal towns of the kingdom, and in the Metropolis; and everywhere, as far as we have heard, is giving complete satisfaction.

Fig. 1 is an elevation, and fig. 2 a vertical section of the burner and lantern which Messrs. Bray and Co. have adopted for general use. The top ventilator is composed of two cylinders, *a* and *b*, and a cover, *c*, at the top. The chimney, *b*, is open at the top and bottom, and terminating at the top of the lantern, *d*, opens directly into it. Its top terminates in such a position in the

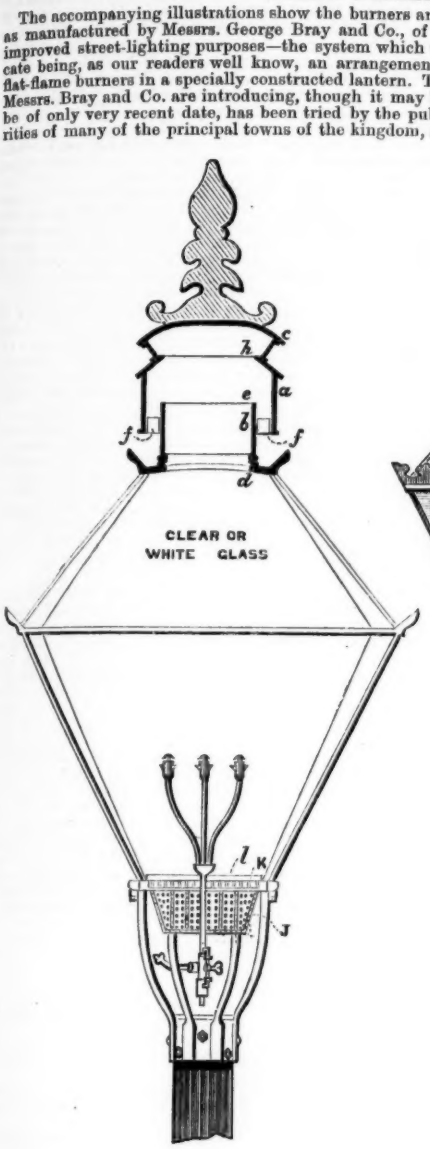


FIG. 2.

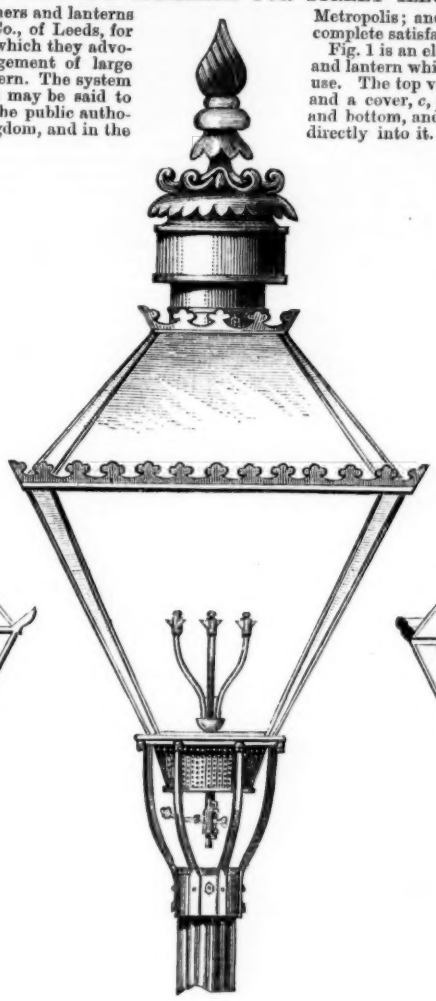


FIG. 1.

SCALE—1 INCH TO THE FOOT.

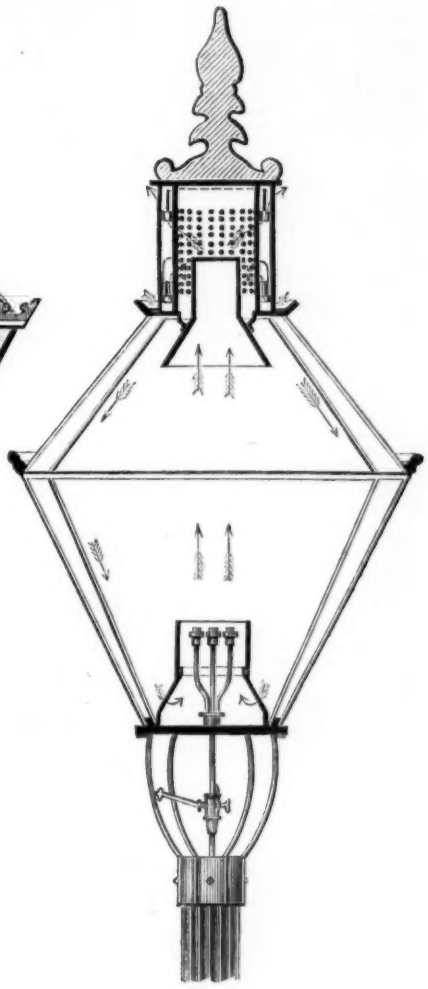


FIG. 3.

interior of the outer chimney, *a*, as, with the aid of the top cover, *c*, to prevent the wind getting into the interior of the lantern at whatever angle it strikes the ventilator. Between the inner and outer chimneys, *a* and *b*, is an annular space, *f*, of about the same capacity as that of the inner chimney. The outer chimney, *a*, is open at the top, and is fixed a sufficient distance from the top of the lantern to allow a perfectly free downward exit of the products of combustion and air. The top of the outer chimney, *a*, is partly closed at *h*, leaving an aperture of about the same area as that of the inner chimney. This closed portion is carried to a sufficient distance above the top of the inner chimney, *b*, to allow of the products of combustion and air to escape down through the annular space, *f*, when the top of the outer chimney, *a*, is almost sealed, as it is by a strong wind. It will be seen that the inner and outer cylinders, with the top cover, are so arranged that, while perfect freedom of exit for the products of combustion and air is provided, it is not possible for any current to pass into the lantern.

The inlet ventilator at the bottom of the lantern is composed of two distinct parts—the intake or diffuser, *j*, and the bed of tubes, *k*, which is covered at the top by a sheet of wire gauze, *l*. The diffuser takes in the air in its usually ruffled state, and, to a large extent, quiets it down or diffuses it, while the small tubes set vertically against each other, with the gauze on the top, ensures its passage into the lantern in a perfectly vertical and quiet state. The intake or diffuser is made of perforated metal, of sufficient depth to take in the requisite quantity of air, and has concentric rings of perforated metal placed vertically inside. It deals with the air as follows:—When the atmosphere is at rest, the air passes in on all sides in a quiet stream. When a wind is blowing, the air rushes in on one side of the diffuser only, and, striking against the concentric rings, has its force and eddies reduced by a small portion only, being turned up at a time in its passage horizontally through the ventilator, and by the currents being mixed up and turned in various directions by the perforations in the concentric rings.

By a proper proportioning of the respective capacities of the inlet and outlet, the necessary area and speed of the column of air required for dealing with the flames are obtained, and are protected in all weathers by the lantern. In this column of air flat-flame burners are set either single, double, or in clusters, to suit the circumstances and the power of flame required. All the burners are fixed either vertically or at a slight inclination from that position; while to avoid the tendency of the edges of the flames to thicken and become smoky in a current of air of this description, the burners are slightly inclined, and the under sides of the flame are protected by projections, as shown in the engravings. By these means the flames are made to curl round the reverse way of the inclination, and are brought within the influence of more air, and the heat of the adjacent flame; the result being that the edges are made intensely white and luminous, instead of being smoky, as when burners are used in the old style.

Figs. 1 and 2, as before stated, show the lanterns Messrs. Bray and Co. have adopted for general use, in preference to figure 3, because of the necessity there is in that arrangement of a conductor chimney for conveying the required current of air to the flames. Fig. 3 is taken from the drawings of their first patent (No. 1454 of 1879), and is an arrangement whereby the top ventilator is made to answer as an inlet and outlet combined; the products of combustion going out of the upper portion, while the fresh air admitted through the perforations at the bottom of the outer cylinder passes over the conductor, and enters the lantern down its sides. The air is then conducted up to the burner—but below the flame—by a cylinder or chimney perforated at the bottom (as shown in the drawing), or raised above the bottom of the lantern at a sufficient distance to admit of perfect freedom of inlet to the air. In this lantern, as in the one previously described, the fundamental principle is to cause "a column of air to pass up in such volume and at such a rate of speed as will steady, increase the brilliancy of, and give control over the lighting power of the flame or flames submitted to its influence;" and in the column of air to "place the flames, singly, doubly, or in clusters, and in such close proximity to each other, without touching, that their brilliancy is increased, and the smoking tendency diminished."

Messrs. Bray and Co. have also more recently introduced an improvement in the ribs of which the lanterns are made, which give a maximum of strength with a minimum of light-obstructing surface. It consists of a doubled strip of metal being placed lengthwise, edgeway up, along the centre or gutter of the inside of the lamp ribs, to which it is soldered. It is sufficiently high above the rib sides, upon which the panes of glass rest, to form a separating barrier between the panes, and to prevent each pane encroaching upon the other portion of the rib.

SHEFFIELD WATER-WORKS COMPANY.

The Annual General Meeting of this Company was held on Monday, the 12th inst.—Mr. W. COCKAYNE, Chairman of the Board of Directors, presiding.

The following report was presented:—

After payment of all expenses of the Company, interest on debentures, the sum of £31,490 10s. dividends on preference shares, and £4618 10s., the dividend after the rate of 2 per cent. per annum on the ordinary capital of the Company for the half year ending the 30th of June last, paid on the 1st of November last, there remains, including the balance of revenue account brought from the year 1878, and appearing in the account published with the report of last year, the sum of £28,240 7s. 9d., the balance of the

Company's undivided revenue. The Directors recommend that out of this a dividend after the rate of 2 per cent. per annum for the half year ending the 31st of December last shall be paid on the 1st of May next on the ordinary capital. This payment will absorb £4618 10s., leaving the balance of undivided revenue £23,621 17s. 9d. The Directors believe that it will be more conducive to the interests of the Company to limit the present dividend to the small rate recommended, than to divide a larger sum now, with the possibility of a reduction hereafter, when, in accordance with the order of the Court of Chancery, the whole burthen of the interest arising from the expenditure on works not fully productive will be borne by that portion of the Company's income applicable to a dividend on the ordinary shares.

The Directors have much satisfaction in calling the attention of the Shareholders to the fact that, notwithstanding the almost unprecedented depression of trade during the year 1879, and the large destruction of house property during the same period throughout the borough of Sheffield for street alterations, the income of the Company, derived from water-rates, has increased since the year 1878 by the sum of £467 15s. 3d. This amount is much less than that which, on an average of years, is added to the Company's water-rates, but arising, as it does, under the adverse circumstances adverted to, it affords both an excellent proof of the stability of the Shareholders undertaking, and ground for belief that, when commercial prosperity is re-established in the town of Sheffield, the water-works will be remunerative as well as safe. The additional property to which water has been laid on during the year 1879 will produce, when occupied, upwards of £1500. The Company now supply with water 59,483 houses, besides other property. This number of houses exceeds by 1489 those supplied in 1878.

In accordance with the terms on which the C preference shares were created, the holders had the option of converting them on March 30, 1879, into ordinary shares. None of the Shareholders, however, availed themselves of that option, and consequently all the C shares, being £150,000 in amount, will remain preference shares in perpetuity, the dividend being reduced from 5½ to 5 per cent. per annum since March 30, 1879. This change of rate reduces the annual preferential charge against the ordinary shares by £750, which yearly sum will for the future go to increase the amount applicable for ordinary dividend; but as the reduction commenced only on March 30, 1879, the full benefit of the change has not arisen during the past year.

The supply of water to Chapeltown began in January last, and various applications for water supply from the pipes laid to the village of Dore have also been made. These, in the opinion of the Directors, indicate the probability of an increasing demand in that district.

Since the last report of the Directors, £57 5s. per annum of the ground-rents near Crookesmoor have been sold, and contracts have been arranged for the sale of 5a. 1r. 30p. of land in the same locality to the Corporation of Sheffield, for the purpose of a recreation-ground, and of a smaller portion of land on the Crookesmoor Road to other persons. The greater part of the land described as Lot 1 in the printed particulars of sale of 1878, with Limerick Wheel and the adjoining land, are the only properties then advertised for sale which now remain undisposed of. The Directors consider that if proper prices can be obtained for these properties, it will be advantageous to the Company to dispose of them.

In the autumn of last year some public alarm was caused by a report made by Dr. Hime, the Officer of Health for the borough of Sheffield, pointing out the probability of contamination by sewage of one of the service reservoirs of the Company at Crookesmoor, and the Directors believe that the grave danger thus apprehended was popularly supposed to have arisen from the sale of parts of the Company's property there. The Directors are satisfied that the Shareholders will give them credit for being fully impressed with the paramount importance of doing everything possible to maintain above suspicion the purity of the Company's water, and they would have supposed that the public of Sheffield might have felt assured that no pecuniary temptation would have induced them to make any change in the Company's property which could have created the slightest risk of a calamity so great as the contamination of the public water supply. The facts are that before dividing into lots for sale the land which was to be sold, under powers granted after inquiry by Parliament as long ago as the year 1860, the Directors consulted Mr. T. Hawksley, Mr. J. Ayris, and Mr. Frederick Fowler with respect to the precautions to be taken to protect the reservoirs from possible contamination by infiltration, in case the land sold should be used for building purposes. Everything suggested by the great experience of these three gentlemen was carried out, and with a view to guard against pollution by smoke, the land was sold subject to prohibitions against its use for trades or manufactories by which such pollution could be caused. After those precautions, the report of Dr. Hime was certainly a matter of surprise to the Directors; but, on investigation, it appeared that the source of the alleged possible contamination was not on any part of the land sold, but in property which never had belonged to the Company at all. Believing it their duty fully to investigate the alleged danger, the Directors called in Dr. Tidy, of the London Hospital, an eminent Chemist, specially conversant with water analysis. He made a careful examination not only of the water of the reservoir, stated by Dr. Hime to be specially in peril, but of all the other service reservoirs, and of the sources of supply, and of the water drawn from the pipes in the town. He reported positively that no pollution, such as that anticipated by Dr. Hime, existed or had existed, and his report of the quality of all the water he tested was (as invariably has been the case with the water of the Company) entirely satisfactory.

In a case heard before the learned Stipendiary Magistrate of Sheffield, in the spring of last year, respecting the right of the Company to recover unpaid rates, by cutting off the supply of water of the defaulter, the Magistrate expressed his opinion that in order to preserve the remedy it was incumbent on the Company to collect all their domestic rates in advance, at the commencement of each quarter of a year, in lieu of the end, according to their previous practice. In deference to that opinion, the Company made the change in their mode of collection on March 25, 1879. The alteration is beneficial to the Company, and having been accepted without hesitation by the consumers, the Directors hope that no inconvenience has been caused by it.

The Company's Engineer-in-Chief reports as follows:—

"To the Directors of the Sheffield Water-Works Company.

"30, *Great George Street, Westminster, Feb.* 10, 1880.

"Gentlemen,—In accordance with your instructions, I have made the usual annual inspection of the storeage reservoirs of the Company, and now beg to present my report thereon, as follows:—(1) The three Redmires reservoirs.—These reservoirs are all in excellent general condition, nothing being required except some very slight amendments of the pitching, and the laying of a few agricultural drains to carry off stagnating surface water. (2) The two Rivelin reservoirs and the depositing pond are all in good repair. (3) The three Loxley reservoirs completed and filled. The embankments and other main works are in a very satisfactory condition. In the case of the Strines reservoir, it will be desirable to take an early opportunity for re-adjusting the puddle wall and pitching to their intended heights, in consequence of the levels having been somewhat reduced by the natural consolidation of the new earthworks. The similar operation at the Dale Dyke embankment has been recently completed and approved.

(Signed) "T. HAWKSLEY."

The outgoing Board is composed of the following gentlemen:—Mr. W. Cockayne, Mr. J. W. Hawksley, Mr. H. Crookes, Mr. T. Cole, Mr. F. W. Colley, Mr. W. I. Greaves, Mr. P. Smith, Mr. S. Roberts the younger, and Mr. H. Jubb, all of whom are eligible, and offer themselves for re-election.

The CHAIRMAN moved—"That the report of the Directors for the past year, now produced, be approved of and entered on the Company's minutes."

Mr. HAWKSLEY seconded the motion.

Mr. S. SMITH observed that in the report for 1878 there was a statement to the effect that the Company expected to be able to supply manufacturers with water on reduced terms. He should like to ask if that proposal had been responded to, and whether a number of manufacturers had taken the water, and so increased the revenue to any considerable extent.

Mr. G. HIDES said he noticed in the report that the Company's work in connection with Chapeltown was actually complete, and that they had commenced to supply water there from the 1st of January last. He had seen some mention about other applications, and he wished to ask whether there had been any tangible applications in regard to extension in that direction, and whether the Directors intended to report as to the outcome of any such applications. He would like further to know whether anything had transpired in reference to the application regarding a supply of water to Handsworth Woodhouse. The Directors, he believed, had had this in contemplation in certain things they had done, and as the Shareholders only met once a year, he thought it desirable to have all the information they could possible get for the welfare of the concern.

Mr. F. E. SMITH said he objected to one clause in the report, and that was in reference to the payment of rates in advance. He felt that if he did not raise some objection to it, it would appear as if the Shareholders all agreed cheerfully to pay five quarters water-rate in one year. He did object most strenuously to this. He, of course, felt that the Water Company had the power, and therefore, perhaps, the less said the better. But he felt that if the report was allowed to go out showing that the Shareholders received the arrangement quite cheerfully, it would seem as though they all agreed to it. He, however, protested, and would say that it was not at all necessary, in the case of ordinary tenants who had been in the town for a very long period, and had always paid their rates promptly, to require their money in advance.

Mr. P. SMITH, in reply to the first question, said he believed there had not, up to the present, been any considerable increase in the trade demand, owing to the fresh scale which the Company had adopted for supplying large consumers. That scale of charges had been adopted by the Company after very careful consideration, and he believed it was one which would be viewed very favourably indeed by the consumers when there was an ordinary state of trade. The trade of the town had, however, been exceedingly bad, and the Company were pleased to find that they had not lost ground as regarded their trade consumers. The Company now had a well-considered and carefully-settled scale by which they could deal with consumers of all kinds, whether large or small; and they certainly hoped in the future to do a larger business on this account. Mr. Hides had noticed that the Company had supplied Chapeltown, and asked whether there were any further applications from outlying districts. He (Mr. Smith) believed that during the past year there had not been any further applications. One district had made application, but it was beyond the Company's parliamentary limits. They were, therefore, obliged to refuse it. As regarded Handsworth Woodhouse, the people there were short of water, and were desirous to have it from Sheffield. The matter, however, was in negotiation, and the Shareholders must leave it in the hands of the Directors, who would, if they could, arrange matters mutually satisfactorily. Mr. F. E. Smith had asked a question as to the rates being payable in advance. He could not tell what was the feeling of the consumers, in whom Mr. Smith seemed to be very much interested. All the Directors knew, and all they were interested in, was that the rates had been very freely paid without any objection being raised. The Directors had not met with any difficulty. They were not before acting in an illegal, but perhaps in an informal manner, by collecting at the end of the quarter, because the law required that the general rates of the Water Company should be collected in advance on the first day of each quarter. This plan had not been adopted by the Company, because it had been their practice to collect at the end of every quarter. The difficulty had always been this, that when they started the new system of collecting in advance, they must, in the first instance, collect two rates together—one for the quarter which had passed under the old system, and the other for the quarter which was just beginning under the new system. That course they thought would be very inconvenient to the ratepayers, and they went on in the old way. The present plan had been forced upon them by the decision, or rather the strongly-expressed opinion, of the Stipendiary Magistrate of Sheffield, that by not collecting their rates in advance they were running a risk of jeopardizing some legal interests. Therefore the Directors had thought it necessary, in the interests of the Shareholders, to collect the rates in advance. As to collecting from one man in advance and from another at the end of the quarter, it could not commend itself to the Shareholders good sense for a moment. They must have the same system throughout. There had been no opposition to it, and no ill-feeling engendered. They had overcome that point very nicely, and they were now going on the regular system of collecting the rates in advance.

The motion was then put, and carried unanimously.

On the motion of the CHAIRMAN, seconded by Mr. HAWKSLEY, a dividend at the rate of 2 per cent. per annum was declared.

The retiring Directors were then re-elected.

Mr. J. WILSON moved a vote of thanks to the Chairman.

Mr. F. BURNEY said before the resolution was put he should like to move that the Shareholders present had thorough confidence in the Directors with regard to the management of the bath question. He saw, in looking over a list at one of the banks, that some of the Shareholders were subscribing to oppose the Water Company.

Mr. BLAKELOCK SMITH (the Company's Law Clerk) said some of the Shareholders were not only subscribing, but were actually on the Committee of the Association for the purpose of opposing the Company.

Mr. BURNBY said a house divided against itself could not stand, and, therefore, he moved that they, as Shareholders, should go hand in hand, and let the Directors know they had their entire confidence and support in the action they were taking.

Mr. G. WARRISS seconded the resolution, believing that every Shareholder in the meeting had full confidence in the Directors as to their action in relation to the bath question. If they were acting illegally, it was not right, either on the part of Directors or Proprietors, and he considered the sooner the matter was settled the better. Still, he had confidence in the Directors, and thought they would do what was just, right, and proper. He was exceedingly sorry to see that some of the Shareholders of the Water Company actually started the Association which was now opposing them. He went to the Association meeting, and was very sorry to listen to some of the remarks made by those who were connected with the Company.

Mr. S. SMITH said before the resolution was put he should like to make a few remarks. He was a Shareholder, and not a very small one, and he thought the action of those who were opposing the Company on the question of baths was right. He believed their action was right, because for some years past a number of persons had not been paying their bath-rate, whilst others had been paying. He held it was right on the part of the Company that they should take legal proceedings against some of the defaulting persons, so as to have the matter settled, and that it was also right on the part of others who thought they were not called upon to pay their water-rent twice over—because that was what paying for baths really meant—to oppose the Company's action. The Company had not been quick enough in settling the law on the subject. The law might have been settled some time ago without going to very great expense. He expressed the hope that when the Directors had obtained the opinion of the Court in which the action was laid, they would not go to a higher Court, and so needlessly throw away a lot of money. When they had obtained the opinion of the Court, the Directors would be free from any blame in the matter, inasmuch as they had done all that could be expected of them, and it was undesirable to throw away the money of the Company in protracted legal proceedings. He should be very glad indeed to have the matter settled. The sooner it was settled the better—better for the Company because it would put a stop to much ill-feeling which at present prevailed.

Mr. G. HIDES recommended that the resolution should be withdrawn, for one very cogent reason, that inasmuch as the Directors had taken action in the matter some six or eight weeks ago, and it had been fairly before the community as well as the Proprietary, and they had voted the old Board back again without a word of demur, they had practically given the Directors their fullest confidence.

Mr. P. SMITH said with regard to the baths, Mr. Blakelock Smith had been throughout most anxious to avoid legal expense, and so indeed had the Directors. He (Mr. P. Smith) was not going to make any accusation

or to say where the blame lay, but the Company had at last been forced into litigation. The matter now only waited the pleasure of the Court to decide it. He could not say exactly when it would be decided—probably before many months were over—or whether it might be necessary to take it to a higher Court; but it was evident that the matter must be settled, and settled in such a manner that it could not be re-opened. Notwithstanding what Mr. Hides had said, he should prefer to have the resolution put, as it would be well for the Directors if they could be assured that in the course they were now pursuing they had the support of a large body of the Shareholders.

Mr. BURNBY said the reason he should put the resolution was because he had seen the names of Shareholders upon the list of subscribers to the Association formed against the Company. If there had not been those names, he should have thought that the whole of the Shareholders had confidence in the Directors. It would seem that some of them lacked that confidence, otherwise they would not have taken an active part against the Company. He should, therefore, put the resolution.

The resolution was carried with only four dissentients.

Mr. JEFFREY seconded the vote of thanks to the Chairman, and, the motion having been carried, the proceedings were brought to a close.

WOLVERHAMPTON CORPORATION WATER SUPPLY.

At the Meeting of the Wolverhampton Town Council on Monday last week—the MAYOR (Mr. John Jones) presiding—the following report of the Water-Works Committee was taken as read:—

The Water-Works Committee have pleasure in laying before the Council the duly audited balance-sheet and account of income and expenditure of the water-works for the year ending Dec. 31, 1879, from which it will be seen that a profit of £1850 18s. 8d. has been made.

When your Committee presented their report on April 1, 1879, there appeared an accumulation of profits amounting to £6509 9s. 8d., from which, in accordance with the resolution of the Council, there has been set apart as a reserve-fund a sum of £5000.

Your Committee have reduced the domestic rate on houses in the municipal borough from 1s. 6d. to 1s. 3d. in the pound on the poor-rate assessment, and the rent for water-closets to a uniform charge of 10s. per annum for each closet. It is very satisfactory to find that, notwithstanding these reductions, the income from water in the year 1879 was £19,497 1s. 8d., or only £40 12s. 11d. less than that of 1878. The working expenses have, however, been greater than usual. This is partly in consequence of some considerable repairs at the different pumping-stations, but principally by the waste of water caused by the frost in the earlier months of the year, when the daily consumption of water averaged about 3 million gallons, or nearly 1 million gallons more than the usual quantity.

Your Committee, believing that the water-works undertaking will be able to maintain its present position, and considering that the reduction last year was made entirely in the interest of the consumers of water, think that the time has now arrived when they may recommend some relief to the general body of ratepayers. They, therefore, propose that the next improvement rate should be relieved from the payment of the £400 hitherto charged for water used by the Corporation in watering streets and other public purposes. This recommendation, if adopted by the Council, will be equivalent to a diminution of ¼d. in the pound on the improvement rate.

The balance-sheet issued by the Committee showed that the total income amounted to £20,191 3s. 9d.—of which £19,497 1s. 8d. was received from water-rents and sales of water. The total working expenses were £9179 8s. 5d., while the repayment of loans, and payment of interest on the remainder, absorbed £9160 16s. 8d. The profit, therefore, was, as stated in the report, £1850 18s. 8d. The capital account amounts to £232,355.

The Committee also presented a statement of the capital and revenue expenditure, &c., during the twelve years which have elapsed since the Corporation obtained possession of the water-works, and from it we extract the following particulars:—

Year.	Income.	Expenditure.	Profit	Loss.	Percentage of Working Expenses to Gross Receipts.	Coal Consumed per Million Gallons of Water Pumped.	Coal Consumed per Million Gallons of Water Distributed.	Gross Cost per Million Gallons of Water Distributed.
	£	£	£	£		Tns. cwt. qrs.	Tns. cwt. qrs	£ s. d.
1868	13,263	12,711	552	..	36·2	..	..	..
1869	13,517	13,376	141	..	40·2	..	..	..
1870	14,371	14,122	249	..	39·9	..	..	..
1871	14,518	15,138	..	620	42·7	..	..	..
1872	14,984	15,843	..	859	45·2	4 11 3	8 7 2	..
1873	15,793	16,412	..	619	46·9	4 6 2	8 1 2	27 5 4
1874	16,564	16,526	38	..	45·3	4 5 0	7 19 0	25 6 4
1875	17,387	16,574	813	..	43·3	4 5 2	8 1 2	23 5 1
1876	18,174	16,483	1691	..	40·7	4 4 1	7 18 1	22 7 7
1877	19,289	17,587	1702	..	43·1	4 4 2	7 18 0	24 11 10
1878	20,066	16,647	3419	..	36·6	4 3 2	7 16 0	21 4 6
1879	20,141	18,290	1851	..	44·3	4 8 3	8 8 1	21 7 3

In the municipal borough there are 15,145 houses, of which 12,047 are supplied with water from the Corporation water-works. There are, therefore, 3098 houses in the borough, the inhabitants of which are still dependent upon wells for their water supply.

Alderman EDWARDS, in moving that the report be received and entered on the minutes, called attention to the fact that notwithstanding the severe winter, which had occasioned breakage of pipes and extra pumping, a handsome profit had been made by the Water-Works Committee.

Alderman BANTOCK, who seconded the motion, thought it would be satisfactory to the public if some explanation were forthcoming as to the cause of the increase in the working expenses from 36·6 per cent. in 1878 to 44·3 in 1879.

Alderman WALKER observed that there was a satisfactory explanation forthcoming in the circumstance that, as stated in the report, there had been extra expenses for repairs at the different stations, and more especially that there had been a very large extra expense in consequence of the last severe winter. This had necessitated the pumping of 50 per cent. more water than the average quantity, the proportion being 3 million gallons per day, as compared with 2 millions.

The motion was carried, and the Council proceeded to other business.

STOCKTON AND MIDDLESBROUGH CORPORATIONS JOINT WATER BOARD.

The Monthly Meeting of this Board was held on Monday, the 12th inst., when the report of the District Auditor (Mr. J. Radford) was received. It was addressed to the Chairman and Members of the Board, and in it he said: "In pursuance of section 52 of your Water-Works Act, 1879, I have audited the accounts of receipts and expenditure from the time you got possession of the works from the old Company—viz., July 1, 1878—to Feb. 14, 1879, as directed by the Local Government Board, the latter date being nearest to the 25th of March, as named in the section, and when similar accounts close, the audits will in future be for a year ending as near as possibly may be to March 25. Though but for seven months, the audit involved the examination of—(1) The heavy law and parliamentary expenses for obtaining the Act, £27,601; (2) those for the arbitration to settle the sum for compulsory sale and prospective value of the works above the 25 years purchase—£10,181—of the maximum statutory dividend of the old Company—viz., £466,175; (3) the award for compulsory sale and prospective value, £213,802; (4) the old Company's debts and their cost of arbitration, £121,137; (5) stamp duty on conveyance, £3400—making a total of £842,296. It is much to be regretted that the law and parliamentary proceedings should have been marked with so much hostility. Had more pacific counsels prevailed, a great deal of money might have been saved to the ratepayers. There may have been faults on both sides, but it was surely injudicious to offer £5 for 'compulsory sale and prospective value,' when £213,802 was awarded. The above offer led you into that serious item of £10,181 for arbitration costs, besides letting you in for those on the other side, and so swelling the debts due from the Company to the large sum of £121,137. When litigation runs so high as in these instances, there is practically no check on the charges of legal, parliamentary, and engineering talent. Had the contention been for a principality instead of for a moderate water company, more expense could hardly have been incurred. As your Act does not give the Auditor the usual powers of disallowance and surcharge, I can only report, and in doing so it is not easy during a four years warfare to say that particular items are wrong, and might not be justified by circumstances at the time they were paid. It does, however, appear to me that auxiliary forces were brought into alliance with the Corporations at considerable cost. Likewise, that £1684 was a large sum to pay the owners of Dinsdale Dam in respect of their opposition; also, £37,000 was large for surveying and boring; £4500 was large for engineering; and £12,456 for Solicitors, Parliamentary Agents, and Counsel's fees, irrespective of the arbitration. Under a peaceful view of the subject, such outlay could hardly have occurred."

Mr. J. DODDS, M.P., after referring to this report, moved—"That Mr. James Radford, the District Auditor, be reminded that his duty is to audit and examine the accounts, and to report to the Board on the accounts audited and examined, and that consequently his observations on the policy of the respective Corporations of Stockton and Middlesbrough are alike impertinent, unjustifiable, and in excess of his duties."

This motion was seconded and carried, after the words "alike impertinent, unjustifiable, and" were struck out.

A report was then submitted to the Board preparatory to its being laid before the two Corporations, which was afterwards ordered to be done. It stated that the capital account showed an excess of expenditure over receipts amounting to £33,652 16s. 2d., of which £16,000 had been spent by the Corporations. The Board, on Feb. 10, issued precepts on the Corporations, which had since been honoured, for £10,000, leaving £23,652 19s. 2d. still unborrowed, and it would be necessary for the Board to retain a considerable amount of undivided profits. On Feb. 14 this stood at £14,916 2s. 5d., but although they had retained this large amount, they were under advances from their banker to the extent of £12,980 3s. 7d. The revenue account during last year exhibited a considerable growth, having reached £42,236, against an average of slightly over £40,000 in the years ending June 30, 1877 and 1878 respectively. This was due, in great measure, to the increased charges for water. The expenses of the Board had also increased, and were £1096 7s. in excess of that of the average expenditure of the Company for the years named above. Acting under resolutions passed by the Board, the Corporations made application to the Local Government Board for a Provisional Order to facilitate the discharge of the Board's duties, and to postpone the obligation of the Board to begin the works authorized by the Act of 1876, and they would wait with anxiety the result of the application, because, should it be unsuccessful, it would be necessary for the Corporations to consider most earnestly how they would best discharge the duties imposed upon them by their Acts, without laying on the ratepayers of the town too great a burden. The prospect of a revival of the industries of the district made it incumbent upon the Corporations to prepare for an increased consumption of water, and before many months elapsed it might be the duty of the Board to ask the Corporations to consider the propriety of carrying out the provisions of the statute as to new works, or of applying to Parliament for powers to modify the provisions.

ON THE USE OF WATER IN ASCENSION-PIPES.

By Mr. W. A. WOOD, of Syracuse, U.S.A.

[A Paper read before the Central New York Gas Engineers Association, Feb. 19, 1880, and extracted from the "Official Report" in the *American Gaslight Journal*.]

At our last meeting, the statement was made that an adequate remedy had been found for freeing and keeping clear the stand-pipes in our retort-house. The necessity for some such remedial agent is generally acknowledged by those running with high heats; and from the interest manifested in this matter, it was thought a more elaborate account of our operations might not prove unacceptable to the Association.

The method adopted was brought under our notice, in May last, by the Superintendent of the Homer and Cortland works, whose foreman had been experimenting, and had derived much benefit from the use of water, either evaporated from an iron vessel placed within the mouthpiece just before sealing the retort, or introduced above (through a syphon), and allowed to trickle down the inside of the stand-pipe. We have since learned that the use of water in either manner is by no means novel; but the idea was certainly original with the gentleman mentioned above, and the general surprise at the simplicity and efficiency of this "water cure," expressed by those present at our August meeting, proves that the system is not very widely known in this section of the gas world at least. Mr. Jones, the Superintendent of the South Boston works, affirms that he employed a similar method for relieving his pipes so long ago as 1851, and further states that he found no evil effect arising from its constant employment, although not using it at present, as he finds relief through petroleum residuum, which he uses as an enricher.

Wherever the honour of discovery or invention may properly belong, our experience has convinced us that the judicious introduction of water inside the pipes can be unequivocally commended. Different methods of applying the water may suggest themselves to different engineers. With us, the main water-supply pipe is run along the front of the stack, and wired to the stand-pipe just below the flange connecting the ascension and bridge pipes. A pillar-cock is introduced at the centre of each stand-pipe, and below this a syphon is tapped through (fair with the inside of) the stand-pipe, having sufficient seal to overcome any back pressure in case the exhauster is shut down. The syphon is of ¼-inch pipe, capped with a ¾-inch reducing coupling, which serves as a funnel to receive the water from the pillar-cock above. The funnel is placed, say, 3 inches below the cock, permitting the flow of water to be observed from the floor below. The water is introduced drop by drop, and, with a little care, the amount may be so adjusted that it will moisten the entire length of the longest pipes, and still be nearly, if not entirely dissipated, before reaching the mouthpiece. The tar, as it collects, finds no foothold on the moistened surface of the iron, and, like water from the traditional goose's back, slides down into the mouthpiece, where it is easily cared for.

Our stoppages, previously common to all the pipes, and most frequent and obstinate in those leading from the upper retorts, after the water was turned on, occurred only in the pipes connecting the lower retorts, and just above the mouthpiece. The obstruction consisted of a mixture of tar and dry carbon, and gathered very rapidly after the charge. A cylinder-

shaped reamer of steel, 4 inches in diameter, with a cutting edge on top, was substituted for our ordinary stand-pipe auger, and this introduced into the mouth of each pipe before charging, together with the water dripping in from above, has banished the bugbear of stopped pipes from our works.

Several difficulties were apprehended from the contact of the hot gas with water at such an early stage of the process; but a thorough test has proved them all imaginary.

Providing a free passage for the gas, and obviating the frequent removal of lids, an increased yield necessarily followed. With old benches, and a portion of coal partially damaged by fire, the yield for May was 4·85 feet per lb. of coal. With no other condition changed, other than the introduction of water, the yield for the succeeding month of June was 5·09 feet, and there was no appreciable diminution of candle power. The heat of the stand-pipe is ample for vaporizing the water, and, with moderate care, a dangerous quantity need never reach the retort. The vapour is doubtless returned to the main, and condenses as water, there being insufficient heat to decompose the steam, so that liability to surreptitious production of water gas, and its concomitant, carbonic oxide, is not imminent.

Again, so small a quantity of water cannot materially affect the temperature of the gas, and naphthaline deposits, which were with some reasonableness anticipated, have not appeared.

With us much trouble is experienced, in purification, from the nature of our water. Containing, as it does, a large percentage of lime, a calcareous deposit results from its union with the sulphur in the gas. This limey product accumulates very rapidly in the chambers and overflow of the washer.

We apprehended the most serious objection to the use of water in our stand-pipes, fearing a deposit that would be even more refractory than the tar; but the incrustation, if any, forms so slowly that we have, as yet, been unable to find it.

After a six months trial of this method of relieving our pipes, we can find nothing that militates against it, and have adapted it to all our benches. The change in the retort-house is marked. Fourteen lids off in five hours—a wood fire burning around two stand-pipes; melting milesians ramming red-hot irons down from above in others, encouraged by all that official vituperation could accomplish—was a typical morning's experience in May last. Now, with tar fires burning off from 1600 to 2000 feet in five hours, lids are never removed except for drawing the charge. A Sabbath-like quietude pervades the retort-house between charges, and the necessity for professional expletive no longer exists.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

So far as all classes of round coal are concerned, the supplies coming into this market are considerably in excess of the demand, and there is no indication that they will be anything else than abundant for some time to come, as the means of production are now so great that it would require a very much larger increased consumption than there is at present any prospect of, to absorb the output of coal which the Lancashire collieries are capable of producing. At present a good deal of short time is being worked, but this does not prevent the accumulation of heavy stocks, and prices have now reached so low a point that colliery proprietors are unable to make further concessions, although buyers who are in the position to take off large quantities promptly are able here and there to purchase at under current figures. The average selling prices at the pit mouth are now about 8s. per ton for best Wigan Arley, 6s. to 6s. 6d. for inferior sorts and Pemberton four-feet, and 5s. to 5s. 6d. for the common Wigan mines. A few inquiries are cropping up for gas coals, but there is nothing yet doing to test the market, and only a rough guess can be given at prices. For the better classes of Lancashire screened gas coal about 8s. per ton at the pit would probably be asked, with inferior sorts ranging as low as 6s. per ton. Any improvement in the coal trade is entirely confined to engine classes of fuel, and with regard to these there is generally a firmer tone. Slack, which of late years has gone more largely into consumption owing to altered boiler appliances, is in good demand, whilst supplies are short in consequence of the small quantity of round coal now being screened, and fully 3s. 9d. to 4s. per ton is asked for good sorts at the pit mouth; whilst many consumers having now to fall upon burgy, this class of fuel is better to dispose of, and 4s. to 4s. 6d. per ton is about the average price for good qualities at the pit mouth.

In the shipping trade there is very little doing, although a few more inquiries have been coming to hand within the last few days.

In the iron trade there has been a very depressed tone, with a decided downward turn in prices. Local makers have found themselves unable to stand against the lower prices ruling in other markets, and during the past week list rates for Lancashire pig iron have been reduced to 65s. per ton, less 2½ for delivery into the Manchester district, whilst 2s. 6d. per ton below this figure would not be refused if good orders were offered. All descriptions of finished iron are also easier, Lancashire bars being now obtainable from makers at about £8 per ton for delivery into the Manchester district.

The leading firms amongst the local engineers, machinists, and founders are reported to be fairly employed.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There was not any improvement in the trade of these parts last week. Prices are by an effort prevented from receding. The steam coal trade, notwithstanding the fact that the Baltic is now open to business, was flat, and, with some exceptions, the collieries were for a time busy. Loading turns were short. A pretty good business was transacted in best gas coals. Cargoes were shipped over sea. Prices remain unchanged. The demand for second-class gas coals is falling off. There has been an improvement to note in the shipments of coke to the Mediterranean and the Baltic. Prices are, however, off and on, about the same; but coke manufacturers are more keen of business than they were a month ago. It may be reported that the market is well supplied with all sorts of coals; that any prospect of establishing an advance in prices was less hopeful last week than the week before; and that the "golden age" to coalowners—of large advances in prices—is, and is likely to long remain, a dream of the past. The coal market of the North of England is void of every element of speculation, and a quiet, humdrum sort of business is doing.

The iron markets of the North showed a tendency to lower rates last week. The shipments of iron to the United States are getting less.

The demand from the Continent, before noticed, of material for the renewal of furnaces, &c., is still continual. The shipments of fire-bricks and fire-clay goods are pretty general to most of the European ports. The demand for chemicals, of which so much was expected from the United States and Europe, is disappointing, and the Newcastle chemical market was very bare of orders last week. Prices could hardly be upheld.

The coasting freight market is represented by 4s. per ton steamers to London, 7s. sailing ships to the North of France, and from 6s. to 6s. 6d. to the English Channel ports, all to load gas coals. There was an abundant supply of handy coasting vessels last week, which were difficult to place. The shippers had the command of the market.

The value of lead, spelter, and metals of that description, showed a slight improvement last week. But it was very little. There was a large delivery of lead in pigs on the Tyne from Spain. As regards goods of that kind (red and other lead included) the period of inflation is over. Business is working back to a normal state, and it is fully anticipated that these goods will realize their nominal value and no more.

TAMPERING WITH A GAS-METER.—At the Ayr Burgh Court, last Thursday, Bailie M'Lachlan on the Bench, John Christie, manufacturer of aërated water, residing in George Street, Wallacetown, was charged, under the Sales of Gas Act, 1859, with having tampered with his gas-meter so as to defraud the Newton Gas Company. He pleaded not guilty, but was convicted on evidence, and sentenced to pay a fine of 10s., with £2 of modified expenses, with the alternative, in default of payment, of fourteen days imprisonment.

APPLICATIONS FOR LETTERS PATENT.

1456.—LOWE, C., and GILL, J., Manchester, "Improvements in the manufacture of certain coal tar and residual products." April 9, 1880.

1461.—BOULNOIS, H. P., Exeter, Devon, "Improvements in the means of effecting absorption of noxious sewer gases." April 9, 1880.

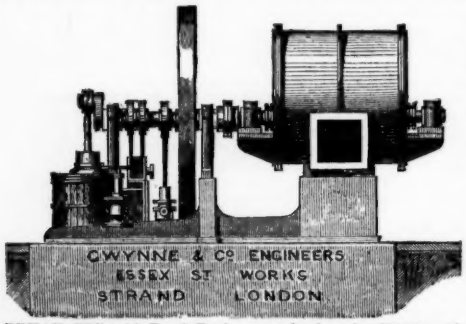
1476.—JENSEN, P., Chancery Lane, London, "Improvements in the production of light and heat, and in apparatus for same." A communication. April 10, 1880.

1478.—MANN, W., Gunnersbury, and WALKER, W. T., Highgate, London, "Improvements in apparatus for the purification of coal gas." April 10, 1880.

1492.—SHANKS, J., Barrhead, and SIM, W., Glasgow, N.B., "Improvements in water-closets, and in valvular apparatus for the same, and applicable otherwise." April 12, 1880.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

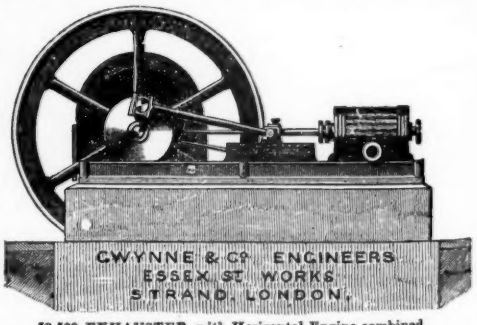
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers,
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

WANTED, Readers of the NEW Edition, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED, a Situation in a Gas Company's Office, as CLERK or ASSISTANT DRAUGHTSMAN. Five years in present employment. Good Book keeper and fair Draughtsman. Aged 19 Salary 25s. a week. Highest references. Address A. BILLINGHAM, Gas-Works, NORTHAMPTON.

WANTED, by a Young Man, an Appointment in a Gas Company's Office. Has been four years in present situation, where he has been used to Book-keeping, Index Taking, and Collecting Accounts. Address JOHN BRETT, Gas-Works, WALTHAM CROSS, N.

WANTED, a Situation as Working MANAGER or FOREMAN of a Gas-Works. Thoroughly understands the Manufacture and Distribution of Gas, and Main and Service Laying, Meter Fixing, and Index Taking, &c., and Fitting in all departments. Address No. 639, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, aged 24, a Situation in large Gas-Works, or Management of small Works. Thoroughly educated in Gas Manufacture, Distribution, and all matters of detail. Seven years practical experience in works making 90 million. Fair Draughtsman, good Writer, and quick at figures. Excellent references. Apply, by letter, to No. 652, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MANAGER wants Re-engagement. Recently engaged at one of the largest Sulphate of Ammonia and Sulphuric Acid Works in the country. 25 years experience in Chemical Works. Good references. Address O. H. W., 10, Freer Street, Battersea Park Road, LONDON, S.W.

BATH GASLIGHT AND COKE COMPANY.

TO GAS ENGINEERS.

THE appointment of Engineer to the above Company will be vacant on the 1st of July next.

The Directors are therefore open to receive applications for the same not later than May 4, to be addressed to the CHAIRMAN of the Company, stating qualifications, age, salary required, references, &c.

A residence is provided.

Offices, Upper Bristol Road, Bath, April 2, 1880.

WANTED, an experienced Main and SERVICE LAYER.

Forward copies of testimonials, with full particulars of age, present situation, wages required, &c., to No. 653, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a steady Man as FOREMAN in a Provincial Gas-Works.

Apply by letter, stating age, family, and wages required, to No. 651, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Partner in an old established Gas-Meter Manufactory. Capital required from £1000 to £2000.

For particulars apply to Messrs. BUCKLEY & MATTINSON, Solicitors, Church Lane, OLDHAM.

TO GAS ENGINEERS.

WANTED, a Working Gas Engineer or FOREMAN, to take charge of the Gas-Works at Mountain Ash, near Aberdare. One with some knowledge of Water-Works would be preferred.

Apply to Mr. W. BELL, Merthyr Vale, near Merthyr, SOUTH WALES.

MANCHESTER CORPORATION GAS-WORKS.

THE Gas Committee are prepared to receive APPLICATIONS for the Appointment of ENGINEER at the salary of £1000 per annum. Candidates must possess a thorough practical knowledge of Mechanics and Gas Engineering, the Preparation of Plans and Construction of Gas-Works and Apparatus, the Manufacture, Purification, and Distribution of Gas upon the most approved modern system, and the various chemical operations in connection therewith.

The Engineer will be required to devote the whole of his time to the service of the Committee, and will be wholly debarred from undertaking private practice.

Sealed applications, endorsed "Application for Appointment of Gas Engineer," stating the name, age, and experience of the candidate, and accompanied by testimonials, are to be addressed to the Chairman of the Gas Committee, and delivered at the Gas Offices, Town Hall, Manchester, before noon on Thursday, May 6, 1880.

The Committee wish it to be distinctly understood that any candidate canvassing will be disqualified.

By order,
JOSEPH HERON, Town Clerk.

Town Hall, Manchester, April 9, 1880.

FOR SALE.—A Set of Four Purifiers, with Centre-Valve, in one frame, measuring over all 12 feet, with Sieves complete. Covers to above nearly new. The whole having been replaced by larger.

Apply to R. J. SHARMAN, Manager, Gas-Works, WISBECH.

SECRETARY and Collector Wanted by the Redcar, Coatham, Marske, and Saltburn Gas Company, to enter on his duties about the 1st of June. Duties—to keep the books of the Company and collect the gas-rentals. Must have a thorough knowledge of book-keeping, and find security for £400. Salary £140 per year.

Application to be made, accompanied by testimonials or references, on or before the 22nd inst., addressed "Secretaryship Application," Gas Company, REDCAR.

THE West Bromwich Improvement Commissioners propose to appoint a Manager at their new Gas-Works. Make about 130 millions. Salary £250, with house, rates, firing, and gas.

Applications, stating age, qualifications, and enclosing two original testimonials, to be sent to me by the 1st of May next.

Applicant to enter on duties on the 25th of June next.

By order,
CHAS. H. BAYLEY,
Clerk to the said Commissioners.

Town Hall, West Bromwich, April 16, 1880.

FOR SALE—A Gasholder, 36 ft. dia- meter, 12 ft. deep, and three Cast-Iron Columns for same.

Apply to S. CROSS, Manager, Gas-Works, ABERGAVENNY.

FOR SALE, Cheap—An Apparatus for Making Gas from Rice Husks, with Brick Furnace, Vertical Clay Retort, &c. Root's Patent Blower, Condenser; Purifier, 4 ft. 6 in.; Gasholder, 8 ft.; with Shafts, Pulleys, Pipes, Connections, &c., complete. Can be bought either complete or in parts.

Further particulars from GEO. HAWKINS, Colne Valley Iron-Works, Halstead, ESSEX.

GAS PLANT FOR SALE.

THE Coventry Gas Company have for SALE—

SCRUBBERS.—One 5 ft. 6 in. diameter, 20 ft. high. One 5 ft. 6 in. diameter, 15 ft. high. One 5 ft. diameter, 20 ft. high; with or without 8-in. Connections and Valves.

GASHOLDER.—One Telescopic, 40 ft. diameter and 34 ft. high, in two lifts; Cast-iron Tank for same, 41 ft. 6 in. diameter, 18 ft. high.

STEAM-JET VENTILATOR.—One No. 2 Körting's Patent Jet Ventilator, with Chest. One No. 5½ Körting's Patent Jet Blower.

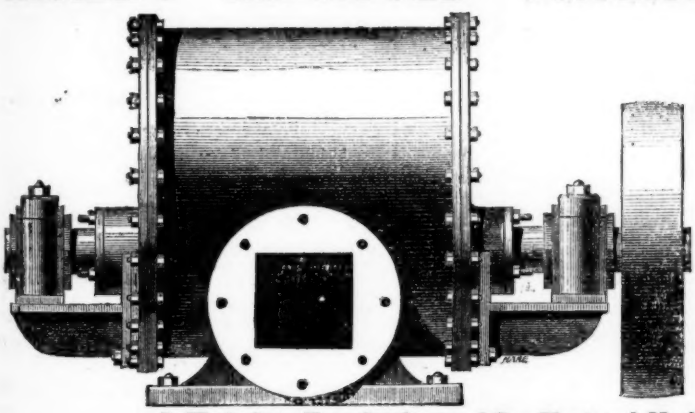
VALVE.—One 12-in. Cathels's Four-way Valve.

The above are being replaced by larger apparatus, and can be removed at once. Also a 100-light Gas Apparatus (Porter's make); this includes a Gasholder, 14 ft. diameter and 10 ft. high, which could be sold separately.

For particulars and prices apply to
W. L. ROBINSON, Manager.

Gas-Works, Coventry, April 17, 1880.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,



WITH OR WITHOUT
WROUGHT-IRON SPINDLES AND
ENGINES COMBINED.

GEORGE WALLER & CO.,
MAKERS OF
ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

PHŒNIX ENGINEERING WORKS:
HOLLAND STREET, SOUTHWARK, S.E.

Now Ready, Price One Guinea,

PRECEDENTS IN PRIVATE BILL LEGISLATION
AFFECTING GAS AND WATER UNDERTAKINGS.

COMPILED BY MR. G. W. STEVENSON, C.E., F.G.S.

This Work contains information with regard to the practice of Parliament during the last fourteen years, in regard to most of the points on which differences arise in Opposed Bills for Gas and Water Undertakings, comprising—Authorized share and loan capital, Rates of dividend, Capitalization of profits, Term for the repayment of loans, Instances in which new shares are to be sold by auction and Exceptions to the Standing Order requiring new shares to be sold by auction, The limitation of back dividends, Illuminating power, Purity, Price, Notice before testing, The conditions under which the public supply of gas is regulated, Alteration of mains, Instances in which maps of mains are required, and All cases in which undertakings have been transferred, since 1845 in gas and 1865 in water, from Companies to Local Authorities.

In the Water Precedents will be found, in addition, The rates for a supply for domestic purposes, and the Rates for other than domestic purposes.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

COUNTY TIPPERARY.

THURLES GAS-WORKS.

SALE AT DUBLIN,
ON TUESDAY, THE 27th DAY OF APRIL, 1880.

IMPORTANT TO GAS COMPANIES, GAS ENGINEERS, AND OTHERS.

TO be Sold by Public Auction, by direction of the Mortgagees, by Messrs. Philip R. Patman and Co., Auctioneers, at the South City Auction Rooms, 23, South Frederic Street, in the City of Dublin, on Tuesday, April 27, 1880, at the hour of 1 p.m.—

All the Estate and Interest of the Mortgagees of and in all that the Houses and Premises situate in Stradaveher Street, in the town and parish of Thurles, now known as the Thurles Gas-Works, held under lease dated June 15, 1874, from Viscount de Chabot, for the term of 80 years, from May 1, 1874, subject to the yearly rent of £3; together with the Retort and Purifying Houses, Retorts, Reservoir, Retort Ovens, Tanks, Gasholders, Purifiers, Service-pipes, Syphons, Mains, Pipes, and Meters, now erected and being thereon or in connection therewith.

The Works, of which immediate possession will be given, will be sold as a Going Concern, and are now in full working order, supplying the town of Thurles, and are capable of supplying 10,000 cubic feet of Gas per day, and, under careful and efficient management, would yield a considerable profit on a comparatively small outlay.

NOTE.—Thurles is a good Market Town, having a Railway Station on the Great Southern and Western line, Dublin to Cork, distant 86¾ miles from Dublin, and having a population of about 5000.

Proposals for purchase by private contract of the above will be received up to the 22nd day of April, 1880, by the Auctioneer, or by JAMES MELDON AND SONS, Solicitors, 14, Upper Ormond Quay, DUBLIN.

A BARGAIN.

FOR SALE—Seven New Iron Retorts, 7 ft. 6 in., 13 by 12½.

Apply to J. LINFORD, Manager, Gas Company, St. Neots, HUNTS.

FOR SALE—A Gasholder, 30 ft. by 12 ft.; also Hydraulic Condenser, Purifier, &c. All in good condition.

For further particulars, apply to JAS. NORMAND AND SONS, Dysart, Fifeshire, N.B.

THE Sunbury-on-Thames Gas Company have FOR SALE the following PLANT, in good condition, thrown out to give place to larger:—

Two Purifiers, 5 ft. by 3 ft. by 3 ft. deep.

Six-inch Connections with Lifting Screw and Traveller complete.

Three 6-in. Cathels's patent Four-way Valves.

Station-Meter to pass 1500 feet per hour, 4-in. Connections.

Five-inch Condenser, nine Pipes, and Tar Box with Overflow Pipe.

Six 6-in. Donkin's Valves.

For particulars and price apply to Mr. JOHN SMITH, Manager, Gas-Works, Sunbury-on-Thames. MIDDLESEX.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—

About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Exhauster (Beales) to pass about 25,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.

Three 4-in. Pumps, with cranked Shafting and a pair of Mitre Wheels.

Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.

Station-Meter by A. Wright and Co., London, with three 12-in. Slide-Valves, and 12-in. Bye-Pass and Connections, to pass about 25,000 feet per hour.

Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned.

R. MORLAND, Engineer.

KNIGHTON (RADNORSHIRE) GAS COMPANY.

THE Directors of the Knighton Gas Company invite TENDERS for the Supply and Erection of Two New PURIFIERS, each 8 ft. square; New Condensers, &c.

Plans and specifications may be seen upon application to the undersigned, to whom tenders are to be sent on or before the 30th of April inst.

The Directors do not bind themselves to accept the lowest or any tender.

WILLIAM A. COLLINS, Secretary.

Knighton, April 17, 1880.

THE Directors of the Torquay Gas Company are prepared to receive TENDERS for the Supply and Erection of Two PURIFIERS, each 20 feet square, with Lifting Apparatus complete, on their Works at Hollacombe, Paignton, and for the Purchase and Removal of the four existing Purifiers, each 12 feet square.

Conditions and particulars may be obtained from the Company's Manager on the Works, and tenders are to be sent to the undersigned on or before the 1st of May next.

J. KITSON, Secretary.

Torquay, April 15, 1880.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

NOTICE is hereby given that the ORDINARY GENERAL MEETING of the SHAREHOLDERS of the above Company will be held at the Offices of the Company, 30, Gracechurch Street, in the City of London, on TUESDAY, the 4th day of May next, at Three o'clock in the Afternoon precisely, to receive the Directors Report and the Accounts of the Company for the Half Year ending the 31st of December last, to declare a Dividend, to elect Directors and an Auditor in the place of those retiring by rotation, and to transact the General Business of the Company.

The Transfer Books will be closed from the 20th inst. to the 4th of May next, both inclusive.

By order of the Board,
ALFRED LASS, Secretary.

Offices, 30, Gracechurch Street, London,
April 6, 1880.

THE Sheffield United Gaslight Company OFFER for SALE the following lots of Retort-House FITTINGS, which they are now taking down at two of their Stations:—

54 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 18 in.
16 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 18 in. by 15 in.
4 Pieces Cast-Iron Hydraulic Main, U-shaped, 9 ft. 6 in. by 16 in. by 15 in.
320 Cast-Iron Mouthpieces, D-shaped, 21 in. by 15 in.
160 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 7 ft. 6 in. long.
215 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 6 in. long.
50 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 5 ft. 6 in. long.
60 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 2 ft. 8 in.
37 Lengths 4-in. Cast-Iron Ascension-Pipes, curved, 10 ft. 2 in.
40 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 10 in.
17 Lengths 4-in. Cast-Iron Ascension-Pipes, straight, 5 ft. 5 in.
481 Lengths 4-in. Cast-Iron H-Pipes.
506 Lengths 4-in. Cast-Iron Dip-Pipes.

The above apparatus has been in use up to a recent date, and is adapted for re-erection.

The Company will be prepared to receive an offer for the whole or any portion of the above. Price £4 per ton, loaded into trucks at Sheffield.

Applications to be addressed to the undersigned.

THOS. ROBERTS, Manager.

Gas Office, Sheffield, March 25, 1880.

TENDERS FOR COALS.
SPECIFICATION.

THE Derby Gaslight and Coke Company are prepared to receive TENDERS for the Supply of 30,000 Tons of SOFT COALS and SOFT COBBLES or NUTS, to be divided into Six Contracts of 5000 Tons each, and to be delivered in the following monthly quantities, viz.:—

		Tons.
1880—	May	240
	June	240
	July	300
	August	420
	September	500
	October	560
	November	570
	December	570
1881—	January	500
	February	400
	March	400
	April	300
	Total of each Contract	5000

The Company will undertake to receive from the party or parties contracting the total quantity of 30,000 Tons, in one, two, three, four, five, or six contracts, as the Board may decide; but they do not bind themselves to accept the lowest or other tender or tenders, until after a satisfactory trial of the Coals and Cobbles or Nuts to which such tender or tenders may relate shall have been made. They are to be the best of their kind, and as free as possible from sulphur, bats, bind, refuse, and dirt, and shall be weighed upon a correctly-adjusted machine.

Payments will be made monthly, if, and so long as, the Contracts shall be duly fulfilled, to the extent of nine-tenths of the amount of the invoices, and the balance will be discharged on the satisfactory completion of the Contract.

Sealed tenders (to be made on forms obtainable at the Company's Office), specifying the description of Coals and the Pits at which they are to be raised, and stating the prices for delivery by canal at Derby, at the New Gas-Works adjoining the Midland Railway Company's premises, or at the Canal Wharf, and also the price delivered at either of the Midland Railway Stations, or at the Great Northern Station, Derby, and in manner and subject to the conditions aforesaid, must be delivered at the Offices of the Company, Friar Gate, on or before Saturday, the 1st day of May proximo.

The respective contracting parties will be required to execute an agreement to be prepared by, and to the satisfaction of the Secretary of the Company.

By order of the Directors,
ISAAC FISHER, Secretary.

Derby Gas Office, April 13, 1880.

WANTED, a small Portable Boiler, suitable for Steaming and Clearing Condensers, Mains, &c., of a small Gas-Works.

Address, with particulars, the Gas Company, Whetstone, near LEICESTER.

TO MANUFACTURING CHEMISTS.

THE Gas Management Committee of the Hereford Corporation hereby invite TENDERS for the Purchase of the AMMONIACAL LIQUOR produced at their Works for One, Two, or Three years from the 1st day of June next.

The terms and conditions of the contract may be known on application to the undersigned.

Tenders sealed, and endorsed "Tenders for Ammoniacal Liquor," addressed to the Chairman, Gas Management Committee, are to be delivered by 11 a.m. on Tuesday, the 4th day of May next.

The said Committee do not bind themselves to accept the highest or any Tender.

By Order,
WILLIAM DAVIS, Secretary and Manager.

Gas Office, Hereford, April 13, 1880.

CITY OF HEREFORD.

CANNEL COAL.

THE Gas Management Committee of the Hereford Corporation hereby invite TENDERS for the Supply of 150 to 200 Tons of CANNEL COAL, quality not less than 30-candle power, to be delivered at the Corporation sidings in such quantities as may be required during the year ending May 31, 1881.

Tenders, sealed and endorsed "Tender for Cannel," addressed to the Chairman, Gas Management Committee, are to be delivered by 11 a.m., on Tuesday, the 4th of May next.

The said Committee do not bind themselves to accept the lowest or any tender.

By order,
WILLIAM DAVIS, Secretary and Manager.

Gas Office, Hereford, April 13, 1880.

ULVERSTON LOCAL BOARD.

GAS AND WATER DEPARTMENT.

THE Gas and Water Committee invite TENDERS for the supply of 300 tons of CANNEL COAL for gas purposes, to be delivered in such quantities, and at such stated periods as may be required during the 12 months ending June 30, 1881.

The Cannel offered must be the best of its kind, and must be as free as possible from all bats and dirt.

Parties tendering must give full particulars of the Cannel offered and the colliery from which they propose to supply, and state the price per ton delivered, carriage paid, to Ulverston Station.

Sealed Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Cannel," will be received by me until the 29th inst.

JNO. SWAN, Engineer and Manager.

April 17, 1880.

ERECTION of CHEMICAL PLANT.

SPECIALITIES.

LIQUOR AMMONIA APPARATUS, GAS LIQUOR, URINE, &c.
GREAT IMPROVEMENT IN PLANT.

SULPHATE OF AMMONIA APPARATUS.
Continuous Method.
IMPROVED "COFFEY STILL" PROCESS, &c.

APPARATUS FOR MAKING AMMONIACAL LIQUOR FROM NITROGENOUS MATTERS.

Models of above plant, prices £2 10s., £3 10s., £7 10s.

Assistance given to parties erecting or about to erect Apparatus, either personally or by correspondence. Terms moderate.

JOHN G. HARVEY, MILNSBRIDGE, HUDDERSFIELD.

Price 28s. each, handsomely bound in Morocco, cloth sides, gilt edged and lettered.

THE FIRST AND SECOND VOLUMES
OF

KING'S TREATISE

On the Science and Practice of the Manufacture and Distribution of

COAL GAS.

Edited by THOS. NEWBIGGING, C.E., M.Inst.C.E., and W. T. FEWTRELL, F.C.S.

Orders received by
WALTER KING, 11, Bolt Court, Fleet Street, London, E.C.

Now ready, Second Edition, price 7s., by post 7s. 3d., the

GAS MANAGER'S HANDBOOK.

By THOMAS NEWBIGGING, M.I.C.E.

Orders to be sent to

WALTER KING,
11, BOLT COURT, FLEET STREET, LONDON, E.C.

GAS COAL.

THE MIRFIELD COAL COMPANY are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of* 16·67-*candle gas, with* 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·88.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON.
London Agent: Mr. F. J. LEE SMITH, 33 THROGMORTON ST.

NOTICE TO MANAGERS OF GAS COMPANIES.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to

FRANK M'GEDY, Secretary.
126, Chancery Lane, London.

H. & C. DAVIS & CO.'S

Illustrated Catalogue sent Free.

FAMILY GAS KITCHENERS, HOTEL GAS RANGES, ARTIZANS & COTTAGE GAS COOKERS, BREAKFAST GRILLERS, &c. GAS BATHS, CIRCULATING GAS BOILERS, ASBESTOS FIRES, AND CHEERFUL HEATING STOVES.

286, 288, & 290, CAMBERWELL ROAD, LONDON, S.E.

JOHN ROMANS, C.E., F.G.S.E.,
CONSULTING GAS ENGINEER
AND
CANNEL COAL FACTOR,
30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

NOW READY.

Will be sent post free, on receipt of 4s. in stamps,
THIRD EDITION, "Improvements in Gas Apparatus." By GEORGE ANDERSON.
With 22 Illustrations of Retorts, Purifiers, &c., &c.
Re-written and enlarged, with a chapter on the "Purification of Gas," by Mr. R. H. PATTERSON, late Metropolitan Gas Referee.
To be had of WALTER KING, "JOURNAL OF GAS LIGHTING" Office, 11, Bolt Court, FLEET STREET, E.C.; or of the Author, 35A, Great George Street, WESTMINSTER.

METROPOLIS WATER-WORKS PURCHASE.
Second Edition. Just published, 8vo., cloth, 2s. 6d.
REMARKS on the Rating of Gas and Water Works and on the Principles of Compensation involved in the Transfer of Water Undertakings from PRIVATE to PUBLIC AUTHORITIES, with an Addendum relative to the proposed Transfer of the Metropolitan Water Companies to a Public Trust. By JOSEPH QUICK, Jun., M. Inst. C.E.
LONDON: E. AND F. N. SPON, 46, CHARING CROSS.

Price 5s., post free. Limp cloth.
ANALYSES of COALS & CANNELS,
MADE FROM BULK.
By ROBT. I. TOOTILL,
COAL AND CANNEL ANALYST AND PRACTICAL GAS CHEMIST

LONDON:
WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

Now ready, price 18s., *bound in cloth, gilt lettered,*
THE THIRTY-FOURTH VOLUME
(JULY to DECEMBER, 1879,)
OF THE
JOURNAL OF GAS LIGHTING,
WATER SUPPLY, AND SANITARY IMPROVEMENT.

CLOTH CASES, GILT LETTERED,
For binding Vol. XXXIV., may be obtained,
PRICE . . . 2s. 6d.

LONDON:
WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

Imperial
METER COMPY.
LIMITED,
Makers of THE IMPROVED DRY GAS-METERS, THE PATENT WET GAS-METERS, Special Meters for Public Lighting, STATION-METERS, Governors, &c.
KING'S ROAD, ST. PANCRAS.
Formerly also (Walter Ford) at Gray's Inn Road.

M. DAVIS & CO., 27, Wellclose Square, LONDON, E.,
COMMERCIAL GLASS WORKS.
BEST OPAL SHEET GLASS, IN CASES OF 200 FEET.

150 Y	7d. per foot.	26 Y	11d. per foot.
21 Y	9d. ,,	32 Y	1s. 3d. ,,

Enamelled Sheet Glass, Flint and Opal, 1s. 2d. Coloured Glass and Opal, 1s. 6d. to 2s. 6d. per foot.
GAS GLASSES OF ALL DESCRIPTIONS ON HAND; SPECIAL PRICES FOR QUANTITIES.

ANTI-CORRODO TUBES
(BARFF'S RUSTLESS PROCESS)
See Professor FOSTER'S *Article on "The Corrosion of Iron" in* JOURNAL *of March* 30, 1880.
THE RUSTLESS AND GENERAL IRON COMPANY
(JAMES E. AND SAMUEL SPENCER),
Makers of ANTI-CORRODO (BARFF'S) TUBES AND FITTINGS
For Gas, Steam, and Water; also Black Galvanized and Enamelled.
WORKS: West Bromwich. *Quotations and Pamphlet on application to* **97, CANNON STREET, LONDON, E.C.** LIVERPOOL OFFICE: 34, Moorfields.

J. & H. ROBUS,
BUILDERS AND CONTRACTORS
FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,
RETORT-SETTING—A SPÉCIALITÉ.
ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.
ESTIMATES GIVEN FOR MAIN-LAYING.
N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.
Address:—J. & H. ROBUS, BELL GREEN, CATFORD, LONDON, S.E.

HOLYWOOD GAS COMPANY, LIMITED.

THE Directors of this Company are pre- pared to receive TENDERS for their Surplus TAR and AMMONIACAL LIQUOR for One year from 1st prox.
Particulars may be had on application to the undersigned.
Tenders, addressed to the Chairman, to be delivered not later than the 24th inst.

THOMAS HUNTER, Secretary.
Holywood, Co. Down, April 6, 1880.

MANCHESTER CORPORATION GAS-WORKS.

TENDERS are invited for the Purchase of a STATION-METER, made by Crossley, of London, and capable of passing 30,000 cubic feet per hour; also for Two TURNTABLES, 12 ft. in diameter, with cast-iron Tops, Rails, Pulleys, &c.
Further particulars upon application to Mr. George B. Jackson, Town Hall, Manchester.

By order,
JOSEPH HERON, Town Clerk.
Town Hall, Manchester, April 9, 1880.

TO GAS-WORKS ERECTORS, &c.

THE Directors of the Dowlais Gas Com- pany are prepared to receive TENDERS for IMPROVEMENTS and EXTENSION to their GAS-WORKS.
Ground plan and specifications to be seen at the Board Room at any time after this date.
Tenders to be addressed to R. Harrison, Esq., Dowlais, Glam., on or before April 30, 1880, marked "Tender for Improvements to the Dowlais Gas-Works."
The Directors do not bind themselves to accept the lowest or any tender.

TO GASHOLDER MAKERS.

THE Directors of the Newmarket Gas- light and Coke Company are prepared to receive TENDERS for the Construction and Erection of a Telescopic GASHOLDER.
Plans and specifications may be seen upon application to the undersigned, to whom tenders are to be sent on or before the 26th of April inst.
The Directors do not bind themselves to accept the lowest or any tender.

By order,
THOMAS WILKINSON, Manager and Secretary.
Gas-Works Office, Newmarket, Cambs,
April 2, 1880.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Directors of the Staines and Egham Gas and Coke Company, Limited, are prepared to receive TENDERS for the Purchase of the whole of the AMMONIACAL LIQUOR produced at their Works at Egham for the term of One, Two, or Three years (at the option of the Directors), commencing from the 1st of May next. The pumping will be done by the Company's machinery.
Further information may be obtained of the Manager at the Works.
Sealed tenders, marked "Tender for Liquor," to be sent to the Secretary on or before the 3rd of May next.

JOHN ANTHONY ENGALL,
Solicitor and Secretary.
Staines, April 9, 1880.

STAINES AND EGHAM DISTRICT GAS AND COKE COMPANY, LIMITED.

THE Directors of this Company invite TENDERS for the Supply of 3000 Tons of New Pelton or Pelaw Main GAS COAL to be delivered at the Company's Works, situate on the southern bank of the Thames, in the parish of Egham, and outside the City Coal Dues boundary. The Coals to be delivered as follows:—400 tons in each of the months of October, November, December, and January next; 300 tons in each of the two following months of February and March; and the remainder as ordered before Sept. 30, 1881.
The tenders to state the price per ton for cash for each month's delivery, and for credit for three months.
The Directors will not accept any conditional tender, nor necessarily the lowest, or any tender.
The tenders to be forwarded to me on or before the 3rd of May next, sealed and marked "Tenders for Coals."

JOHN ANTHONY ENGALL,
Solicitor and Secretary.
Staines, April 6, 1880.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Bristol United Gas- light Company are ready to receive TENDERS for the Purchase of TAR produced at each of their Stations, situated respectively at Avon Street, Canons Marsh, and Stapleton Road, from Jan. 1, 1881.
The approximate quantity of Tar made annually at each station will be—at Avon Street, 500,000 gallons; Canons Marsh, 350,000 gallons; Stapleton Road, 100,000 gallons.
Tenders to be for Three or Five years, but contracts will not be taken for a longer term than five years.
The terms and conditions of the contract may be known on application to the Secretary, at the Office of the Company, Canons Marsh, Bristol.
Tenders, sealed and marked "Tenders for Tar," must be delivered not later than Tuesday, May 4, 1880.
The Directors do not bind themselves to accept the highest or any tender.

By orders of the Directors,
HENRY H. TOWNSEND, Secretary.

SECOND-HAND ENGINES, EXHAUSTERS, BOILERS, &c.

THE Scarborough Gas Company invite OFFERS for the Purchase of their present Duplicate Exhausting Machinery, comprising Two 7-in. Cylinder by 14-in. Stroke Horizontal Steam-Engines; Two 20,000 cubic feet per hour Gwynne and Beale's Patent Exhausters; Two Hydraulic Governors in Connection with Throttle Valves of Engines; and Two Cornish Boilers, 11 ft. by 3 ft. 9 in.
The whole are of superior make and have been carefully used, and are well worth attention, being about to be removed for replacement by larger and more powerful apparatus.
The machinery may be seen in operation until the 30th of April, and further particulars may be obtained on application to the undersigned.

By order,
WILLIAM J. MOON, Manager.
Scarborough, March 5, 1880.

BRAY'S PATENT LANTERN AND FLAT-FLAME BURNERS.

Having some time ago dealt with Mr. Sugg's statement that his Street-Lighting Apparatus yielded "over 30 per cent." more light "over all others" in the market, in a manner that caused its prompt withdrawal, we had hoped that the necessity would not have again arisen to defend ourselves against statements calculated to mislead Lighting Authorities and the public.

At the exhibition of gas-lamps recently held at Birmingham, an error in Mr. Sugg's favour—admitted to be such by the experimenters, and known to be such by all those who have had to do with making comparative tests with these lanterns—having been made in the test with the 200-candle power lantern, it has been extensively advertised without the correction accompanying it in Mr. Hunt's report.

How little correctness there is in Mr. Sugg's fresh advertisement will be gathered from the following facts, which he has been careful NOT to publish:—

1. Mr. Sugg has not noticed Bray's 80-candle high lighting power flat-flame, which Mr. Hunt tested along with the other burners we sent, and which Mr. Sugg knows to have yielded 3·51 candles per foot; and he has omitted to state that this is a higher result than that produced by either of his 80-candle Argands, which was 3·26 and 3·41 candles per foot respectively; and this without deducting the 40 per cent. that the Argand necessarily loses in actual use (see paragraph 5). The great bulk of the street-lighting apparatus sent out by Mr. Sugg are 80-candle power, and have been freely advertised as yielding "over 30 per cent. more light," &c.
2. Mr. Sugg does not state that all Bray's burners with which he compares his own are of "medium lighting power," known to be such by the Birmingham authorities and by Mr. Sugg, and distinctly stated to be such in all our lamp sheets. Therefore, in comparing his *high* lighting power with our *medium* lighting power burner, without stating the fact, he takes an unfair advantage of a competitor, and the public are misled.
3. Mr. Sugg does not point out that there is but one (and that the least used) of the Argands which he names, which shows a superiority of more than 12 per cent. over Bray's above-mentioned 80-candle power burner.
4. Mr. Sugg does not mention that the flat-flame burners he exhibited were beaten by Bray's 80-candle power flat-flame to the extent of 8 per cent. in one test, and 12 per cent. in another; but he distinctly states that his flat-flame burners "produced the highest result in illuminating power of all flat-flame burners present."
5. Nor does Mr. Sugg draw attention to the fact that the Argand cannot be made to yield in "actual use" the light it shows when tested by the ordinary photometer. We state—and our utmost effort has not availed us to get Mr. Sugg to contest the points with us—that the lack of top and bottom light (as compared with Bray's flat-flame) reduces the total all-round yield by about 20 per cent.; and that the Argand burner cannot be governed, in "actual use," to yield within 10 per cent. of its best, because of the liability of the flame to smoke with the slightest increase of pressure when working at its full capacity. And a further deduction of 10 per cent. must be made because of the chimney becoming rapidly dirty, and permanently opaque, by use, if it does not happen to break.
6. Mr. Sugg also omits to mention that the lantern in which his 200-candle power burner was tested was not the Sugg "shadowless," of which there have been so many sold, but one designed by Mr. Hunt, which yields a much greater amount of light.
7. And, while Mr. Sugg gives prominence to a result admitted to be erroneous by the experimenters, he entirely omits to mention the correction which accompanied the report from which he professed to quote. This result showed that when both apparatus were rated to consume exactly 46·75 feet of gas per hour, the lights were equal when the shadow meter was 73 ft. 2 in. from Bray's flat-flame lantern, and 76 ft. 2 in. from Mr. Hunt's improvement on the Sugg Argand lantern; and from this result allowance must be made for the defects of the Argand when in actual use, as per paragraph 5.

In view of the above, a proper estimate will be placed on Mr. Sugg's recent declaration that he "will have nothing to do with challenges," but "will continue to give, as he has always done, correct information of the results to be obtained from his burners and lanterns."

Extract from the *Leeds Mercury*, April 1, 1880.

At the meeting of the Leeds Town Council, March 31, Alderman Gaunt moved that the Council approve of the acceptance by the Corporate Property Committee of the tender of Messrs. Geo. Bray and Co. for the supply of 21 new lamps, to be placed upon the pillars round the Town Hall. The Committee had tested Sugg's and other lamps, and found Messrs. Bray's the best. It was intended to have two 200-candles power and two 100-candles power, and 17 round the hall of 80-candles power. Mr. Lynd, in seconding the motion, said that he had had an opportunity of seeing different lamps tested at Birmingham, and he was in favour of Messrs. Bray's.

Extract from the *Daily Free Press*, Aberdeen, Jan. 1, 1880.

Judging of the merits of the lights as they appeared last night, on-lookers seemed to be generally of opinion that between Sugg's patent and Bray's larger light at the corner of Union Buildings there was no very perceptible difference in the illuminating power. When the vital question of gas consumption is taken in account, it is found that in the Castle Street lamps there is a marked difference in the quantity of gas consumed, for while 30 feet of gas is hourly burned in Sugg's Patent Lamp, only 20 feet are necessary for the illumination of Bray's Lamp during the same period.

THE ABOVE LAMPS HAVE METERS ATTACHED.

These lanterns have been adopted by the Vestry of St. George's, Hanover Square, London, for all the crossings and refuges of that important district, after direct competition with the Argand system of lighting; and also by about forty towns and vestries, after, in most cases, a similar competition.

WORKS: BLACKMAN LANE, LEEDS.

PARIS EXHIBITION, 1878.

J. E. WILLIAMS & CO.,

SOLE MANUFACTURERS OF THE

SPECIAL METALLIC OXIDE PAINT,

Largely used by Gas Companies, Corporations, Railway Companies, Ironfounders, and Machinists.

PARIS EXHIBITION, 1878.

It has the following qualifications and properties:—

Effectually prevents and arrests corrosion.
Has a fine gloss, and is very durable.
Does not require driers like other paints.
Protects iron from action of water.

Is not affected by sulphuretted hydrogen.
Forms a very hard, tough (not brittle) surface.
Will not crack, blister, or scale.
Is not affected by extremes of temperature.

Covers nearly double the area of other paints. (7 gallons or 1 cwt. will cover 1211 square yards of ironwork.)
Is cheaper and more economical than any other.

VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.

ECONOMY IN THE PRODUCTION OF GAS.

PLUTONIC CEMENT,

FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

A Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.

THE WIGAN COAL & IRON COMPANY,

LIMITED.

MIDLAND DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: A. C. SCRIVENER,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

REAL OLD SILKSTONE GAS COAL.

C. A. HAWORTH & COY.,

STANHOPE SILKSTONE COLLIERIES,

SILKSTONE, NEAR BARNSLEY,

Are prepared to supply their celebrated **Real** Old Silkstone Gas Coal and Nuts. Prices quoted to any Railway Station, or f.o.b., Hull, Goole, Keadby, Grimsby, Liverpool, and Fleetwood. Every information given on application to above address, or to their Agent,

ALBERT USHER, 5 Office, Finsbury Park, London, N.

THE BLAINSCOUGH HALL COLLIERY COMPANY.

BEST WIGAN ARLEY GAS COAL.

Yielding (as per analysis) 11,970 cubic feet of 16·39 candle gas per ton. Copies of analyses and testimonials from **Gas Companies** and **Managers**, who have used the Coal in large quantities for several years, will be forwarded on application.

Postal address, **CHORLEY**, Lancashire.

Waggon address, **COPPULL SIDING**, near **WIGAN**, London and North-Western Railway.

SAMPLE QUANTITIES SENT ON APPLICATION.

GAS-WORKS FOR SALE ON THE CONTINENT.

The Comptoir Général of Gas and Water Works has been entrusted by several Proprietors with the Sale of their Gas-Works.

Value of Works.—The Prices vary from £4000 to £25,000.

Terms of Sale.—The Works are to be sold at the value of their present net Revenue, varying from 7 to 10 per cent.

Terms of Payment.—Either cash, or one-half cash and the other half to remain, at 5 per cent. interest, as a first mortgage charge on the works.

Duration of Concessions.—From 20 to 40 years. On their expiration, the Town Authorities either take over the works at a valuation, or renew the Concessions.

Applications will be received until the 20th of April, and any further information supplied by the

COMPTOIR GÉNÉRAL D'USINES À GAZ ET CONDUITES D'EAUX.

Le Directeur-Gérant,

BN. L. MOSER DULFUS.

55, Rue Condorcet,
Paris March 8, 1880.

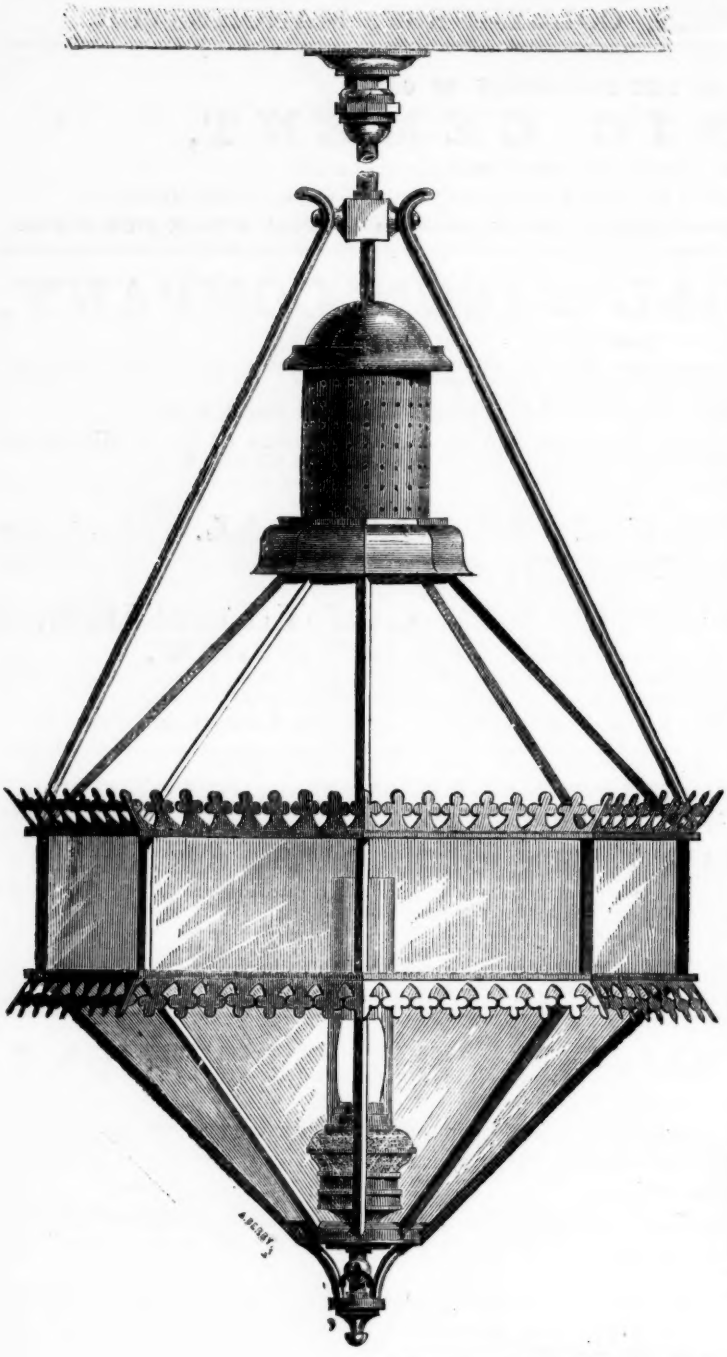
WILLIAM SUGG'S
IMPROVED SYSTEM OF STREET LIGHTING,

SUITABLE FOR CANNEL OR COMMON GAS.

NEW OCTAGON PATTERN LANTERN

For LONDON ARGAND BURNERS of 50 to 400 Candle Illuminating Power, as supplied to the Metropolitan Railway Stations.

Suitable as Columns or Suspension Lights.



Notwithstanding the various statements that have been assiduously circulated of late, tending to prejudice Public Companies, Corporations, and Vestries against the recognized superiority of my large Argand Burners (established by tests made by eminent scientists, and confirmed by testimonials received from numerous Engineers of Gas-Works, which have appeared from time to time in the Advertisements of the JOURNAL), **the Highest Results** obtained at the recent trial of large Burners for Street Illumination held at Birmingham—where the most complete collection of large Burners and Lanterns extant had been assembled—were produced by the **200-candle and other large Argand Burners of my make;** clearly substantiating the statement I have repeatedly published, that the **"Sugg" Burners give over 30 per cent. Illuminating Power more than can be obtained from any other Burners with the like quantity and quality of Gas.**

It remains, moreover, to be mentioned that at the same trial my **Flat-Flame Burner,** with patent circular slit (patented 1875), produced the highest result in illuminating power of all the competitive Flat-Flame Burners present.

PRICES AND PARTICULARS ON APPLICATION TO

WILLIAM SUGG,

GAS ENGINEER,

VINCENT WORKS, VINCENT STREET, WESTMINSTER, S.W.

JOHN HALL AND CO., STOURBRIDGE,

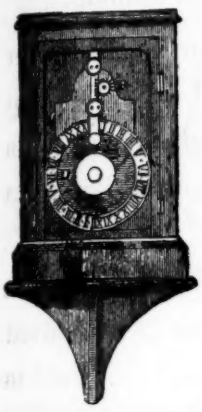
Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

Price's Patent Lamplighters Tell-Tale,

OR TIME RECORDER.



This Instrument has been invented particularly for recording the hours of starting and return of Lamplighters from the Works, or any office, for the discharge of the duties of lighting and extinguishing Public Lamps; but it is also applicable to any establishment in which it is desired to obtain an unfailing record of the attendance or non-attendance of men at their posts at certain periods. Irregularity in the time of lighting Public Lamps leads to complaints, while neglect in extinguishing at the proper hour causes loss to Gas Companies, or where the average meter system is in use, an excess of expenditure on the part of Local Authorities.

SOLE MANUFACTURERS,

ALEXANDER WRIGHT & CO.,

55, 55a, and 56, MILLBANK STREET, LONDON, S.W.

E. & W. H. HALEY,

IRONFOUNDERS & MAKERS OF

CAST-IRON PIPES

FOR

GAS, WATER, & STEAM.

LISTER HILLS FOUNDRY,

BRADFORD, YORKSHIRE.

W. C. HOLMES & Co.,

ENGINEERS AND CONTRACTORS

FOR

GAS AND WATER-WORKS,

WHITESTONE IRON-WORKS,

HUDDERSFIELD.

REFERENCES TO UPWARDS OF 400 WORKS.

THOMAS PROUD,

BROOKFIELD WORKS,

103, ICKNIELD ST., BIRMINGHAM,

MANUFACTURER OF

WOOD GRIDS

FOR

PURIFIERS AND SCRUBBERS,

AND

GENERAL STEEL AND IRON TOOLS AND MATERIAL USED IN GAS-WORKS.

ASHMORE & WHILE,

HOPE IRON-WORKS,

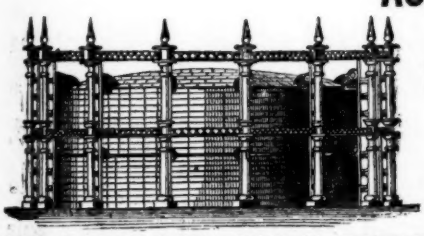
STOCKTON-ON-TEES,

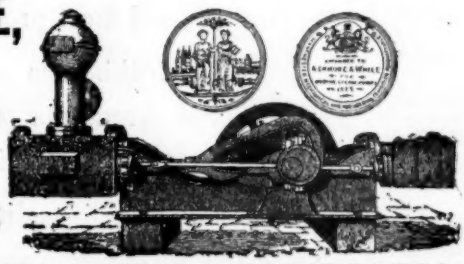
ENGINEERS

AND MAKERS OF

GASHOLDERS

AND





GAS APPARATUS, ROOFS, BRIDGES AND GIRDERS, BOILERS, PURIFIERS AND SCRUBBERS.

Also of the "SLIDE-VALVE" STEAM-PUMP,

For Water, Tar, Grains, Soap, Thick Fluids, Chemical, Gas, or Iron Works, Mines, Breweries, Ships, &c.

No possibility of Valves sticking, as they are actuated by positive motion from an eccentric.

IMPROVED

COMPENSATING GAS-METER.

HUNT'S PATENT.

This Meter supplies a want long felt, by putting an end to the loss sustained by Gas Companies through the overworking of their Meters.

These Meters can now be supplied in either TIN-PLATE or CAST-IRON CASES, and OLD METERS converted to this plan. GAS COMPANIES and CORPORATIONS will find it to THEIR ADVANTAGE to adopt these Meters.

EXTRACTS FROM REPORTS.

"I am able to report that the Meters have given in each test most satisfactory results."—*Mr. H. Sporne, City of London Meter Inspector.*

"I consider the arrangement is a great improvement upon the Meters in present general use."—*Mr. T. Jackson, Meter Inspector, Birmingham.*

"I would observe from the results of my testings that the Meters are a great improvement on the ordinary Wet Meters in general use."—*Mr. H. Airey, Meter Inspector to the Metropolitan Board of Works.*

COPIES OF REPORTS SENT ON APPLICATION.

MANUFACTURED BY

JOHN BENT & SON,

WET AND DRY GAS-METER AND GAS APPARATUS MANUFACTURERS,

BELL BARN ROAD, BIRMINGHAM.

Established 1830.

THE

MANN & WALKERS' PATENT SCRUBBER.

Extensive use.

The successful and extensive use of the Mann and Walkers' Patent Scrubbers in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

Small quantity of Water required.

By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

Residual Product obtained.

The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

Illuminating power increased.

The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

Small amount of power required.

The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

Beckton Gas-Works.

There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

Reserve purifying power contained.

There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

Internal Materials not changed.

The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

Guarantee.

They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

C. & W. WALKER.

8, *Finsbury Circus, London, E.C.*

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

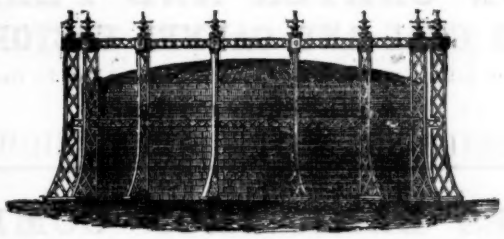
BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS, WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, LONDON, E.C.,

HYDRAULIC ENGINEERS,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT STEAM-PUMPS,

More than 10,000 in use,

ESPECIALLY ADAPTED FOR USE IN GAS AND CHEMICAL WORKS, FOR PUMPING TAR, WATER, AMMONIACAL LIQUOR, ACIDS, &c.

The following are some of the prominent advantages of the BLAKE PUMP:—

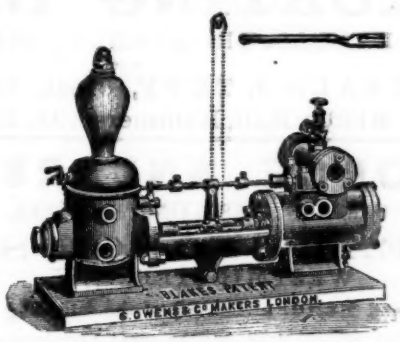
It will start at any point of stroke.

It has no dead point.

It works fast or slow, with the same certainty of action.

It is economical. Has a lead on the slide-valve.

It is compact and durable.



It is interchangeable in all its working parts.

It will deliver more water than any other pump.

It is made of best materials in the most workmanlike manner.

Can be worked at 20 strokes per hour, or 200 strokes per minute.

This Illustration represents Boiler-Feed Pumps, Sizes Nos. 1, 2, and 3, with Hand Lever for working Pump when Steam is not available.

SOLE MANUFACTURERS OF

MANN & OWENS

IMPROVED PATENT GAS-VALVES.

PRICED LISTS AND FULL PARTICULARS FURNISHED ON APPLICATION.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash and when Cannel of the best description is scarce, it may well replace this material."

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,

SCOTSWOOD FIRE-BRICK WORKS, SCOTSWOOD-ON-TYNE.

Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1¼ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

MEMORANDUM FOR GAS COMPANIES.

TORBAY AND DART PAINT COMPANY, LIMITED,

SOLE PROPRIETORS AND MANUFACTURERS OF

WOLSTON'S

TORBAY PAINTS.

OFFICES:

23, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

WORKS:

DARTMOUTH AND BRIXHAM, DEVON.

TRADE MARK.

These celebrated Paints are now very generally acknowledged to be the best and most economical in use. GAS COMPANIES especially have, by experience, proved that no others so fully meet their peculiar requirements, as they are not only UNAFFECTED BY GREAT HEAT and EFFECTUALLY RESIST SULPHURETTED HYDROGEN, AMMONIA, &c., &c., but they may be applied to GASHOLDERS that have hitherto been covered with the unsightly coal tar.

They are also cheaper than other paints and compositions; TWO COATS OF GENUINE WOLSTON'S TORBAY PAINT BEING EQUAL IN COVERING POWER TO THREE OF LEAD PAINT, or any of the numerous low-priced spurious oxides that are now in the market, whilst the durability of Wolston's is unrivalled.

The colours most approved for GASHOLDERS, PURIFIERS, SCRUBBERS, and all the plant and machinery used in and about Gas-Works, are—

FOR DARK TINTS.

No.	p. Cwt.	No.	p. Cwt.
13. Torbay Red	34s.	8. Bronze Green	36s.
6. Dart Brown	34s.	16. Torbay Chocolate	34s.
10. Carriage Red	34s.	4. Brixham Black	32s.
1. Torbay Brown	30s.		

FOR LIGHT TINTS.

No.	p. Cwt.	No.	p. Cwt.
7. Imperial Stone	34s.	19. Light Stone	36s.
29. Portland Stone	38s.	30. Bath Stone	38s.
31. Gray Stone	38s.	38. Buff	36s.

These Prices are for Paints in paste, carriage paid to any Gas-Works in Great Britain, in consignments of not less than 5 cwt.; but all the above colours may be had, READY MIXED FOR THE BRUSH, IN VARIOUS SIZED PAINT CANS WITH HANDLES, AT A UNIFORM PRICE OF 56s. PER CWT. (6d. PER LB.) carriage paid as above, in consignments of not less than 2 cwt., the sizes being 3 lb., 7 lb., 14 lb., and 28 lb. By taking the Paints in this convenient form, a considerable saving is effected in time, &c., as they can be immediately applied by any workman without the intervention of skilled painters to mix and prepare them; besides which all waste is avoided, and they may always be relied on as containing no adulterating or inferior material.

Where light colours are preferred, the work should be primed with two coats of No. 7, and finished with either of the other stone colours;, and when the darker colours are selected, a priming coat of No. 13 is recommended.

Specimen Cards forwarded and Inquiries attended to on application to

23, GREAT GEORGE STREET, WESTMINSTER, LONDON.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

THRASHBUSH CANNEL

12,580 cubic feet of 40·32-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WEDDERSPOON, FERGUSSON AND CO., 21, Lime Street, LONDON, E.C.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

29, QUAYSIDE, NEWCASTLE-ON-TYNE.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

GAS COAL.

THE Tawd Vale Colliery Company, Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete Analysis, on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

Mr. James Paterson, C.E., F.G.S., in his analysis of T. V. Arley Coal, says: "Some parts merge into a semi-Cannel; gas per ton, 10,300 cubic feet; illuminating power, 16·96 candles; coke of high quality, 1431 lbs. per ton."

Collieries, Skelmersdale, near Ormskirk; Offices, 5, New Hall, Old Hall Street, LIVERPOOL.

THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

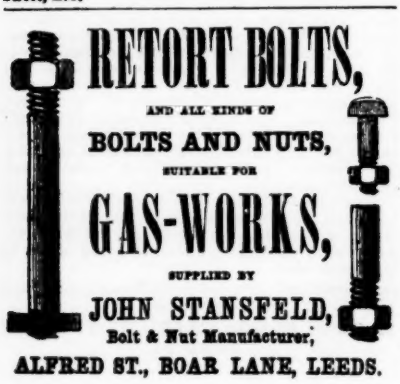
BIRTLEY IRON WORKS,

CHESTER-LE-STREET, DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.



RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES:

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

THE

THAMES BANK IRON COMPANY,

OLD BARGE WHARF, UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS AND ALL KINDS OF GAS-WORKS APPARATUS,

SOCKET-PIPES FOR GAS OR WATER PURPOSES,

FLANGE-PIPES FOR STEAM,

RAIN-WATER PIPES AND GUTTERS,

HOT-WATER BOILERS, PIPES, AND CONNECTIONS,

LAMP-COLUMNS, LAMPS, LAMP-FRAMES, WROUGHT TUBES, &c.,

HOT WATER AND HOT AIR APPARATUS,

Erected complete on the most Improved Principles.

TRADE MARK.

"VICTORIA,"

The Cheapest and Best

LEATHER BELTING

IN LONDON.

The Leather is of the Best Possible Quality, and English Oak Tanned.

Sample Orders of over £5, Carriage Paid to nearest Railway Station.

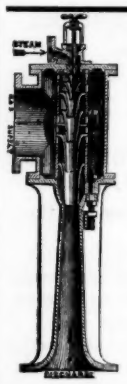
Is Manufactured expressly for

J. C. R. OKES,

39, QUEEN VICTORIA STREET, LONDON, E.C.,

And can only be obtained from him or his Agents.

PRICES ON APPLICATION.



KÖRTING'S STEAM-JET EXHAUSTER,

IMPROVED CLELAND'S PATENT.

UPWARDS OF 400 IN USE.

CLELAND'S PATENT SLOW-SPEED CONDENSER, AND CLELAND'S PATENT STEAM SCRUBBER.

FOR PARTICULARS, APPLY TO

KÖRTING BROS.,

17, LANCASTER AVENUE, MANCHESTER,

OR TO

GERALD J. TUPP, Creek Engine-Works,

Middle Mall, Hammersmith, London, W.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Twenty-Eight Illustrations and Letterpress, on the Construction of Gas-Works, will be sent, post free, on receipt of 4s. in stamps To be had of the AUTHOR; or at the Office of the "JOURNAL OF GAS LIGHTING."

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

LONDONDERRY GAS COALS

DIRECT FROM THE

MARQUESS OF LONDONDERRY'S COLLIERIES.

COUNTY OF DURHAM.

For Prices and Particulars, apply to

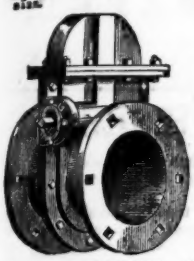
MR. S. J. DITCHFIELD,

LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.

London Agents: Messrs. LAMBERT BROS., 85, GRACECHURCH ST., E.C.

B. DONKIN & Co.'s IMPROVED GAS-VALVES

WITH WROUGHT-IRON PINIONS.



These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.

In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.

Also Sole Makers of

J. BEALE'S NEW PATENT GAS EXHAUSTERS,

and Makers of

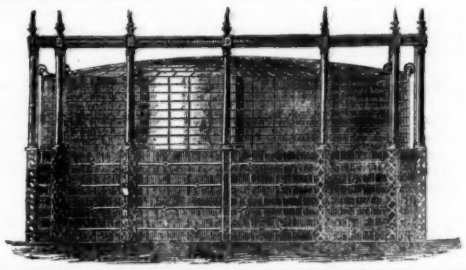
STEAM-ENGINES FOR DRIVING GAS EXHAUSTERS,

VALVES FOR AMMONIACAL LIQUOR,

IMPROVED BRIDGE VALVES FOR REGULATING THE SEAL IN HYDRAULIC MAINS,

BYE-PASS VALVES, SCREW WATER-VALVES, &c.

B. DONKIN & Co., BERMONDSEY, LONDON, S.E.



HENRY BALFOUR & CO.,

ENGINEERS, IRONFOUNDERS, AND GAS APPARATUS MAKERS,

39, FINSBURY CIRCUS, LONDON, E.C.

Works: DURIE FOUNDRY, LEVEN, FIFE, N.B.

MANUFACTURERS OF

GASHOLDERS, SINGLE OR TELESCOPE, WITH OR WITHOUT COUNTERBALANCE GEAR; TANKS, CAST & WROUGHT IRON.

BOILERS, CONDENSERS, CRANES, EXHAUSTERS AND ENGINES,

GIRDERS (Cast and Wrought Iron), IRON PIPES, PUMPS, PURIFIERS, RETORTS & FITTINGS, ROOFS, SCRUBBERS, SHAFTING, VALVES, WASHERS.

ANDERSON'S PATENTED INVENTIONS, VIZ.—

FOUR-WAY BYE-PASS VALVES, ENGINES AND EXHAUSTERS, REVOLVING BRUSH SCRUBBERS, GAS-WASHERS, FUEL-MAKING MACHINES, GOVERNORS, &c.

H. B. & Co. undertake Contracts for the Supply and Erection of Gas-Works, either for Towns or Mansions, or the Remodelling of existing Works.

SHIPPING ORDERS receive special attention.

H. B. & Co. having had large experience in this Department, undertake to ship, f.o.b., properly packed and marked for export.

ESTIMATES AND DESIGNS ON APPLICATION.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER,

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

SANDELL AND SON,

PUBLIC ACCOUNTANTS,

2, GREAT GEORGE STREET, WESTMINSTER.

SANDELL AND SON having been engaged during the past 25 years in Gas Companies Accounts, either in Preparing or Investigating Statements for Parliamentary Applications, Arbitrations, and otherwise, offer with confidence their Services for similar purposes.

ALFRED LASS, F.I.Accts.,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

HARPER & MOORES,

PROPRIETORS OF THE

BEST STOURBRIDGE CLAYS,

STOURBRIDGE.

Manufacturers of all Descriptions of

BEST STOURBRIDGE FIRE-BRICKS, LUMPS, AND CLAY RETORTS

Of all Dimensions for Gas-Works,

GLASS-HOUSE POTS & CRUCIBLES

ESTABLISHED 1836.

The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture. SILVER MEDAL, PARIS, 1878.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,

30, ST. ENOCH SQUARE, GLASGOW.

CAST-IRON GAS AND WATER PIPES.

DELIVERY F.O.B., GLASGOW.

Prices on application.

THE PORTER-CLARK PROCESS

FOR THE

SOFTENING AND FILTRATION OF WATER IN LARGE QUANTITIES, WITHIN SMALL SPACE, AT SMALL COST.

(*See* JOURNAL *of Jan. 6, 1880.*)

In an article upon the Swindon Water Supply, the *Wilts and Gloucestershire Standard* of Aug. 9, 1879, says:—

"All praise is due to the Company who have thus provided a water supply that, if it can be equalled, we are safe in saying cannot be surpassed. . . . For the information of all caterers for public health, we explain that the mode of so effectually Purifying and softening the really good and naturally wholesome water is the 'PORTER-CLARK PROCESS.' 'CLARK'S PROCESS' was known to be chemically admirable; the improvements, however, effected by Mr. Porter, mechanically, are curious as they are perfect."

The filtration is exquisite, and everything arrested is removed daily.

The Visiting Justices of the Kent County Asylum at Chartham on Aug. 29, 1879—

Resolved, "That a favourable testimonial be given to Mr. Porter for his system down to the present time, and that the Clerk forward a copy of this resolution to Mr. Porter." (50,000 gallons daily.)

The Visiting Justices of the Middlesex County Asylum, Banstead Downs, under date of Sept. 12, 1879—

Certify, "That up to the present time the 'PORTER-CLARK WATER-SOFTENING PROCESS,' which has been in operation at this Asylum for about two years, has satisfactorily answered the purposes for which it was intended." (60,000 gallons daily.)

(See *The Times*, Aug. 23, 1877, Paper by Mr. F. J. Bramwell, F.R.S., Meeting of British Association, Plymouth.)

The Proprietor of the *Daily Chronicle* and *Lloyd's Weekly News* writes, Sept. 17, 1879—

"The 'PORTER-CLARK WATER-SOFTENING PROCESS,' erected by you at my paper-mill at Sittingbourne, continues to give satisfaction, and I no longer have any trouble with my steam-boilers. I am not yet working the filters up to their full capacity, only softening about 80,000 gallons per 24 hours, whereas I could easily do more than 120,000 gallons. I may add that it only requires one man to attend to the whole operation."

PATENTED BY JOHN HENDERSON PORTER, C.E.,

1 & 2, TUDOR STREET, BLACKFRIARS, LONDON, E.C.

CROLL'S
DRY GAS-METERS,

PRIZE MEDALS.

LONDON, 1851;
NEW YORK, 1853;
PARIS, 1855.

(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

MANUFACTURED ONLY BY

PRIZE MEDALS.

LONDON 1862;
DUBLIN, 1865
PARIS, 1867.

THE GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON, N.E.

CIRCULAR TO GAS COMPANIES AND OTHERS.

Stourbridge, Jan., 1880.

DEAR SIRS,—As the time for ordering stock for your general requirements for this year is approaching, we beg to call your attention to the various articles of our manufacture, and to solicit your early commands.

Fire-Clay Gas-Retorts.—As some of our friends appear to prefer these *machine made*, we have arranged to supply machine-made Retorts at same price as hand-made ones. At the same time, although it is to our advantage to supply machine-made, we do not recommend them, for the reason stated to you in our Circular of November, 1878. We have a very large stock of Retorts, all in good condition, and of such an assortment that we could supply any size on receipt of order.

Fire-Bricks and Fire-Clay Settings of all Shapes and Sizes.—We have a large and varied stock, or could make to special design at short notice.

Staffordshire Blue Bricks and Paving Bricks.—We shall be glad to submit prices and samples of these on hearing from you, with specification, and we venture to say our brand in these goods is unsurpassed. Hard Blue Paving Quarries make the best kind of Pavement for Retort-Houses, &c.

Coloured and White Glazed Bricks, Porcelain Baths, Kitchen Sinks, Corner Sinks, &c., we are making a great speciality of, and have no hesitation in saying that our glazed goods are unequalled for soundness of manufacture and purity of colour.

Earthenware Drain-Pipes, Cast-Iron Pipes, Wrought-Iron Tubing.—We should be glad of an opportunity of quoting you for these when you are in the market.

Lime, Cement, Plaster of Paris.—Our Lime Kilns at Brettell Lane are now in full operation, and we are in a position to supply any quantity of pure Lime manufactured only from the Earl of Dudley's best Limestone Beds. Our Cements and Plaster of Paris will withstand any required test.

References and Testimonials.—We can furnish you with any number of these; and may mention that during the last thirty-five years we supplied most of the Gas-Works in the United Kingdom and Abroad, and that we have held contracts from Her Majesty's Government for more than Twenty years consecutively.

Awaiting your esteemed favours,

We remain, Dear Sirs, your obedient servants,

HARRIS & PEARSON.

Note.—We shall be pleased to furnish Drawings and Specifications, if desired, and shall be most happy to see you or any of your Engineers here at any time; or, if you would like to see any of our representatives or ourselves at your Works, shall be glad to wait upon you by appointment.

R. LAIDLAW AND SON,

EDINBURGH AND GLASGOW,

SOLE MAKERS OF

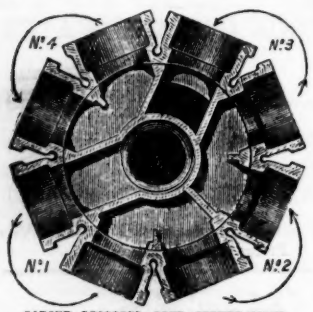
PATENT

RECESSED CONE CENTRE-VALVES,

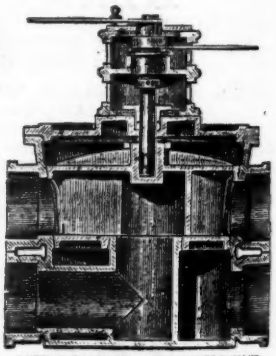
Constructed on the principle of the ordinary Plug-Cock.

THROUGH-WAY & FOUR-WAY COCKS

Of all descriptions.



PATENT RECESSED CONE CENTRE-VALVE.
Sectional Plan.



PATENT RECESSED CONE CENTRE-VALVE.
Sectional Elevation.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

D. HULETT & CO.

Invite the attention of Gas Companies, Corporations, and others to their

PATENT STREET LAMPS,

Which are so constructed that neither putty nor other materials are required to secure the glass. No hacking out of old putty, which frequently destroys the frames. A new pane of glass can be inserted in two or three minutes by any inexperienced person, the glass being secured by a hinged flap and turn button.

PRICE, with Opaline Reflecting Top, 12s.; with Fluted Glass Top, 10s. 6d.
Also made EXTRA STOUT recommended for its durability.

D. HULETT'S IMPROVED SERVICE CLEANSER,

By the use of which stoppages in service and other pipes are freed from naphthaline and other obstructions in a few minutes. PRICE 73s. net.

HULETT'S PATENT MERCURIAL REGULATOR,

For inserting in mains, to prevent the excess of pressure in high ground, or other elevated positions.

PATENTEES OF IMPROVED WET AND DRY GAS-METERS.

Makers of all kinds of Pressure-Gauges, Gaseliers, and every kind of Gas-Fittings for the Trade.

GAS HEATING AND COOKING STOVES.

55 and 56, HIGH HOLBORN, LONDON.

London: Printed by WALTER KING, for the Executors of the late WILLIAM BOUGHTON KING (at the office of Clayton and Co., 17, Bouverie Street, Fleet Street), and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, April 20, 1880.